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Vol. 41, No. 5 Sept.-Oct., 1915 Whole No. 159

United States Naval Institute Proceedings

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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PEACE, OR WAR?[1]

By COMMANDER A. W. HINDS, U. S. Navy

Motto: "War is Hell"

PEACE

In a non-warlike nation like the United States, a navy is mainly built for peace—or for an insurance against war—which amounts to the same thing. This general idea seems paradoxical, for, during the 139 years which have elapsed since the birth of the American republic, the navy has been used for war purposes eight times, or an average of a war every 17.3 years. Notwithstanding the frequency of the use of the navy in battle it is believed that the prime motive inducing Congress to appropriate for war craft is the idea, deeply rooted in the American mind, that a navy reasonably large in number of vessels and efficient to a great degree is a satisfactory insurance against war. Ordinarily it would seem strange for a naval officer to even think, much less write, of peace—that is, an assured lasting peace with all possible or probable enemies; for his training from the time he enters the navy in his boyhood until he leaves it at old age is one continuous preparation for battle.

There has been much talk recently about a permanent world-wide-peace, both in our own country, which has had no keen suffering brought to its own doors, and in war-ridden Europe. If by any chance this ideal condition can be brought about it will affect the navy in a vital manner. With no war and no chances of war, there

[1] EDITORS NOTE.—This article was written in 1914.

NAVAL ACADEMY PRACTICE SQUADRON), FIRST BATTLESHIP TO PASS THROUGH THE PANAMA CANAL. TAKEN IN CULEBRA CUT LOOKING NORTH SHOWING CUCARACHA SLIDE. (THE U. S. S. OHIO AND U. S. S. ILLINOIS ARE FOLLOWING THE MISSOURI)

would cease to be a need for the navy, and an end would come to the annual expenditure of the people for war purposes—a sum which has reached the large figure of one hundred and forty-five million dollars a year for the navy alone. It is advisable, therefore, in considering the prospects of permanent peace, to take into account the reasons for its rupture, *i. e.*:

THE CAUSES OF WAR

In the middle ages people were more prone to war than at present. The fighting man was the only one in good standing. Knights errant waited at the cross-roads most patiently for a chance encounter. To run a course or so "with sharpened lances against all comers" was the proper thing to do: "Even the flicking of a bread crumb or the winking of an eye when properly followed up might lead to the most honorable advancement." It is not with the many causes of past wars that we are concerned, however; it is for us to reason as to probable causes of future conflict—in that way we may be able to arrive at a reasonable estimate as to the probability of trouble with our international neighbors in the future. In the opinion of the writer, causes for future wars are very apt to be included in the following subjects:

(A) Antipathies of reigning houses.
(B) Religious differences.
(C) War to reduce surplus population.
(D) Boundary lines or territorial ownership.
(E) Immigration.
(F) Racial jealousies.
(G) Trade jealousies.

If the above subjects do not cover all causes for future troubles they will be found closely allied to the subjects mentioned.

In order to arrange a lasting peace on a firm basis a majority of the powerful nations must come to a sensible understanding and arrange beforehand a method of action concerning the causes of war.

Taking up the list in detail:

(A) *Antipathies of Reigning Houses* amounts to little. There are few monarchs that have half the power of the President of the United States. It is thought this matter may be dismissed with no other remark.

(B) *Religious Differences.*—Religion has caused more wars in the past than the total of all other differences, but people are becoming more broad-minded in the present day. We do not desire to carve a fellow human being into mincemeat because he is a Mohamedan or a Buddhist. We realize that there are good Roman Catholics and good Protestants, and that there are devout Confucianists. It is, therefore, thought that no wars in the future will result from religious differences.

(C) *War to Reduce Surplus Population.*—This is an old argument for the necessity of war. Northern Asia has not been fully explored; the United States, Canada, and South America will support hundreds of millions of people in addition to their present population; and Africa has hardly been touched. There are millions and millions of square miles of unoccupied territory all over the face of the globe. Furthermore, with the desire to give children all possible advantages in their battle for existence, the small family is developing. The question of overpopulation as a cause of war, for the reasons given, is one that can be allowed to lie dormant for centuries.

(D) *Boundary line* quarrels have caused numerous wars in the past. We all remember well in our history "54-40 or fight." It seemed that boundary line questions were fairly well settled before the war of nations—if that is a good name for it—began early last August. Granting the integrity of China, which many of the most powerful nations had almost agreed to guarantee, the rest of the earth was pretty well portioned off. South America was reasonably stable and each state, barring one or two, was under fairly strong government; Africa was cut to pieces and every European nation had a slice. So it looked as if all countries would settle down to a normal development of the territory held. The future of the Philippine Islands may well be placed under this head. The platforms of both great parties at last election promised eventual freedom to these islands. Do we intend to protect them from encroachments of other nations?

(E) *Immigration* troubles are likely to be peculiar to our own country. There is more immigration to the United States than to any other land. Religious and press freedom and exemption from compulsory military duty seem to make it a Mecca for the discontented of other lands. In addition, wages are better and there are more opportunities for advancement. The son of an immigrant

may become president of the greatest republic in the world. There is a tendency of recent origin to restrict immigration—a committee of Congress has studied the question closely and has advised this step; and anyone visiting our larger cities can see the crying need of it. There are millions of foreign born who do not even speak our language.

While it is but natural for the overcrowded of other lands to try to better their fortunes in this great country of ours, there is a limit to the number that can be admitted. We must educate and assimilate in order to make good citizens. In any case is it not more sensible to stop immigration and develop more slowly and more normally? Is there not too much of a fever to make money with cheap labor?

There can scarcely be friction with other countries over immigration questions if they are all put on the same basis. They will readily see the justice and common sense of our action in protecting the country against overcrowding. Immigration may be unrestricted, restricted to a degree, or prohibited, but the just and equitable rule adopted must apply to "all hands." There can be no "favored nation clauses."

(F) *Racial jealousies:* an almost intangible subject; there is scarcely a way to approach it. If nations come to be actuated by a sincere desire for peace; if the desire is strong enough and is a lasting one; and if the other major causes for war can be handled, racial jealousy will rapidly disappear.

(G) *Trade jealousies.* This is one of the most potent causes of war, and as nations reach out to be first in the development and commerce of their less fortunate neighbors it will assume larger proportions until it finally overshadows all others. There is, of course, only one just and equitable arrangement to be made—free and unlimited trade between each and every nation. It will be difficult for the United States to make this sacrifice. We have fought over it in Congress and at the ballot box for over a hundred years. It is a question whether the workmen of this country will ever be willing to compete with poorly paid foreign labor. On the other hand there is also a question as to whether American labor gets much of the profit from our tariff wall. The number of people with incomes of over a million dollars would seem to show that the working man does not get the lion's share of the profit from tariff.

The writer has set down his ideas of the causes of war. He feels sure that it would be suicidal for his country to think of disarmament or to falter in building warships, or in other preparations for war until the causes listed above can be laid aside by all governments as settled fairly to each. They must be arranged definitely before the slightest progress toward lasting peace can be made. When that is done by able, honest and conscientious statesmen, we may begin to breathe more freely and to have some hope for an end to all war.

Assuming that causes of war can be fairly adjusted by all interested parties, the matters of an international court and of an international police become mere details.

THE INTERNATIONAL COURT

We are slowly being educated beyond the old saying "might is right." The day of the duel is over. In our own country no one doubts the probity of our court of last resort—the Supreme Court. Nations, just like individuals, would undoubtedly get a pure and just decision from an international court composed of representatives from the greater nations. These judges would naturally be the most distinguished men available, would have life tenure, and would be so well paid as to place them beyond the attractions of outside influence.

In calm analysis it does not seem possible that a *majority* of such a splendid body could make an unjust decision. An example of justice by such a body, though much smaller in number than the international court suggested, occurred only a few years ago, when the English members voted against their own government on four out of seven counts in deciding the Newfoundland fishery dispute.

While an international court to settle all national quarrels would surely have the respect of the whole world, it is pertinent to repeat the principle that it would be an absolute *waste of time* to form such a court before the causes of war are removed—by removed, is meant that rules covering causes of war must be made and accepted by the governments making the agreement. It must be borne in mind that cause is always followed by effect.

SEPARATE TREATY METHODS

Our honorable and able Secretary of State has been and is a sincere advocate of peace. Under his guidance our government has made treaties with various nations tending toward peace and tending, perhaps, toward an international court. The criticism of these treaties, if the writer may be so bold, is that when a nation gets ready to go to war with another some kind of an excuse is found and the war automatically causes the abrogation of treaties with the enemy. The method of separate treaties is not safe enough. It lacks co-operation. A combination treaty—all nations entering, or practically all—and in which all concerned agree to join in punishment of any two or more signatory powers that refuse to submit their grievances to a court for settlement, and to abide by the court's decision, would answer. Such a combination treaty would be safe enough to justify disarmament. The charges brought forward recently that certain nations have broken their treaties does not mean that all nations will break their treaties all the time.

THE PEACE PROPAGANDA

The peace movement has been under way a long time; many men of ability, wealth and power have had their shoulders at the wheel. When the warring nations of Europe are totally exhausted and ruined almost beyond hope of recovery, in money and in loss of life, the movement will come forward with still greater force. It is a movement which must be considered in our naval policy; it is a movement which, if brought to a successful issue, would mean a saving to the world of over a billion dollars a year and would bring other untold benefits. There is no doubt whatever that naval officers desire to see the peace program succeed; they can realize as well as others the conditions existing at present in the war ravaged lands and seas—conditions terrible beyond description. It is the writer's belief that no class of citizens of the country have a more earnest desire for an international peace arrangement than naval officers. No class of men would be more happy to see the seventy thousand men or more now engaged in producing and manning war craft change their vocations and get rid of the criticism that they are "non-producers."

The trouble is that those engaged in naval pursuits are afraid the peace propaganda will not arrive at *definite results*, and that anything but the most strenuous preparation may find us with the lamps neither trimmed nor provided with oil. If our statesmen can arrange for a permanent peace—a peace that is clinched and riveted—one of absolute certainty—Splendid! we'll say. Until such a state becomes an actuality, the writer believes it the sacred duty of every man and officer to strain every effort in what is really our life work—preparation for—

WAR

There has been much criticism of the navy within the past few months, in the newspapers and magazines, before the naval committee, and elsewhere. It is a criticism that hurts the naval pride of profession. It is not unnatural that those in the naval service who do their level best should resent being asked if they belong to the "cold storage navy." It can be realized that some of the criticism comes from ignorance of conditions, and that some of it is for political effect, but it hurts just the same—any criticism rankles a bit. Frank and honest criticism, however, if deserved, is a good thing, for it is only by self-analysis or by outside criticism that we improve ourselves and make progress.

At the end of the European War American statesmen will have to make a more important decision than any in our history, barring possibly the Declaration of Independence. They will be *forced* to do one of two things: (1) In conjunction with statesmen from all other important nations arrange a peace that is sure to last by *removing causes* for war and arranging for settlement of all national grievances in an international court. If our statesmen fail to accomplish (1) the nation *must* (2) prepare for war better than has ever been done before and *keep prepared*. If those who govern the country fail to do one of the two they will be taking a risk that is enormous to say the least. The price of defeat is too great for the United States to take any chances. "War is hell," and victors can be expected to show no mercy.

The task of the statesmen—or better perhaps to say the government—in connection with preparing the country for war is to furnish the warlike weapons and the personnel for their operation. The personnel furnished is then supposed to do the rest.

NAVAL CHANGES CONDUCIVE TO GREATER EFFICIENCY

"Comparisons are odious" but, in the humble opinion of the writer, Germany has the most perfect and most efficient war organization in existence. The reason for the wonderful war organization of Germany is that they have plodded and planned. They first decided what they needed and then "turned to" with characteristic German persistence and hammered away until their plans were carried out. It will not be necessary to describe the German system, and it would require too much space, but it will possibly be of some benefit to set down a few conditions existing in our navy which, it seems, might be improved. The most successful are those who benefit from experience. With the German system in mind, but not following it too closely, the writer therefore will enumerate a few items in which he conscientiously thinks there is room for improvement in our navy.

(H) *A National Board on Policy.*—The writer believes there is some foundation for the statement frequently made "we have no policy." There is something akin to a national policy in the Monroe Doctrine, and we would probably fight to defend it. There has been some talk of the "open door" in China, but the mind of the average American voter is not made up on that subject and, as a matter of fact, the chances are that he cares but little whether the door is open or shut. Americans do not look far ahead for commercial possibilities.

Are we to encourage a foreign commerce in American bottoms under protection of the navy? Are we to establish a sphere of influence in the Pacific? What are we to do with the Philippines? If we give the Filipinos their independence, are we to protect them against the encroachments of other nations? There are these and a dozen other questions to be settled: once settled, a change of administration politics should make no difference; the policies adopted should be truly national.

When it becomes definitely known what policies the United States intends to enforce, it will be easy to find out how much of an army and navy it will take to enforce those policies. The board referred to should be independent of politics and should be composed of the most intelligent public spirited men in the country. By having the board independent of politics it will have more spare time for patriotism. Naval policy is entirely dependent on national policy. It will take a certain number of battleships, battle

cruisers, submarines, etc., to enforce one policy, and an entirely different number of perhaps different units to enforce another policy. If we are to seek the enemy and destroy him wherever found we need a larger number of colliers and naval bases than if we intend merely to protect our own coast line. Do we wish to enlarge our sphere of action in any or all oceans? If so, fortified naval bases become a necessity. When such a board, enjoying the confidence of the entire country, has decided on the policies of the country it then becomes the duty of naval experts to decide what shall be the weapons to enforce the policies in question and what is needed in the way of personnel. In order to have any settled policies the board must have some permanency. If a Democratic administration decides, for instance, that we must conduct our war on the sea by seeking the enemy, and a Prohibition administration comes in and decides that it is best to fight with only our land forces when we are attacked on our own shores, the experts who design a building plan to fit our foreign policies are bound to find themselves somewhat out of luck. The United States is being gradually but surely forced to play its part among the great world powers. To do that successfully there has arisen a necessity for co-operation between changing administrations. The whole country might decide on national policies by vote if enough confidence can not be placed in the patriotic wisdom of a selected few.

It takes a long time to build a ship and a far longer time to carry out a building program. If we were certain what principles the country is willing to fight for we could, by reasoning, get some idea as to what nation or combination we might be forced to fight, and make a national building plan to fit the case.

(I) *The Naval General Board.*—The writer has heard frequent criticism that there is no legalized general board, and no general staff at all. The latter statement is, of course, true. As to whether the general board is legalized there is some question. The revised statutes legalize the navy regulations up to 1878. Since that time Congress has legalized certain parts of them from time to time. In any case, such critics are "making a mountain out of a mole hill."

The whole military system is based on obedience to those of higher rank. The Secretary of the Navy, through the President has a right, and it is his duty, to issue orders to carry on business properly in the navy and he does this by the navy regulations,

general and special orders, etc. The navy regulations specify the duties of the general board. As long as those regulations do not conflict with the revised statutes they are all right in a military sense. There should be a body of naval experts—call them general board, or general staff, or what you please—to advise the secretary as to the material and personnel needed to carry out the policies of the United States.

A careful perusal of the navy regulations shows that the duties of the general board, among other things, are that they "shall devise measures and plans for the *effective preparation* and maintenance of the fleet *for war* and shall advise the secretary," etc. This seems broad enough. The name "general staff" is, perhaps, a better one, and the only thing to be gained by "legalizing" it is that its advice might have more weight with the Congress that provides the sinews of war.

Navy policy, entirely dependent on national policy, decides the building program, and it takes years to build. The building program should be the creation of a general staff having the necessary technical knowledge concerning naval matters. The country will have to take it for granted that the general staff will be conscientious and that its members will have no "axes to grind."

(K) *The Secretaries of the Navy, and of War.* These officials are political appointees selected by the President, who always designates the best available men in his party. They are men of successful experience in the business world and men of strong character. They have done good hard conscientious work in the past and are doing it now. It is a wonder that they have succeeded as well as they have, for the mass of professional detail and the thousands of technical questions that arise must be appalling.

The army and navy are examples of the biggest business in the country. There are more complications connected with them than with any other big business. Suppose the stockholders of a railroad company are to select a general manager—do they look around for a doctor or a man in any other profession than railroading?—hardly. They select the very best railroad man they know of, one who understands the business from "A to Z." The successful naval officer enters the service young and works to old age; the very successful ones work hard—no man unacquainted with the service realizes how hard. They stand watch on deck and in the engine room; they gain experience on destroyers and

submarines; they work with gunnery, navigation, signals, and radio telegraphy; they seek duty at everything in any way connected with their profession. Is it not reasonable to suppose that one of the best of such men would be able to produce more efficiency as a general manager of the navy than a political appointee, no matter how brainy, who has had no naval experience?

There is an argument that the appointment of an expert in naval matters as Secretary of the Navy, or an expert army officer as Secretary of War, might have a tendency toward saddling the country with militarism. If American statesmen are not able to arrange a secure and lasting peace with disarmament of all hands at the end of this European War, the quicker the country is saddled with an efficient militarism the better.

(L) *Naval Bases.* We have no naval bases except along our own coast, at Honolulu, and at Manila Bay. Location of naval bases depends on naval policy. Are we to be influential in the Pacific? If so, we must have fortified ports from which to go forth and fight; secure ports wherein to rest, repair, and "gird up our loins" for the fray.

The security and confidence coming from a port "strong as Gibraltar" is of the greatest moral advantage. Does the country realize that it takes years of work and millions of money to prepare such a base?

(M) *Recent Newspaper Criticism.* Inefficiency of material, is not so difficult to remedy. Aeroplanes are not terribly expensive though the training of the pilots would be costly in point of time. Mines are not difficult to manufacture and are not expensive. We are building submarines and destroyers at a reasonable rate. Lack of drill and of maneuvers can be corrected in a short time. One or two target practices should bring back our old efficiency in ability to hit. With a re-distribution of the continuous service men now in the service, all our ships could be manned after training recruits a very short while. The writer does not believe the United States has a "cold storage navy." The average enlisted man learns very quickly. Hard work and enthusiasm go a long way. With a fair leaven of continuous service men a ship with a green crew shakes down in a few months.

The criticisms submitted under (H) (I) (K) (L) and (M) are given after mature consideration because the writer feels that our navy may benefit by them. The remedies are offered in each case. The criticism is constructive, not merely destructive.

CONCLUSION

"Horse sense," to use a western colloquialism, is a national characteristic. Americans are noted for their success along innumerable lines. In order to succeed in any work of magnitude effort must follow the dictates of common sense. World politics may force the United States to build and support a powerful navy, not with the national mind made up that we must go to war, but to be on the safe side and to make sure we will never find ourselves in the condition of unhappy Belgium at present. The writer may be a rank optimist but he believes that if we are forced to prepare for war we will do it well. He believes that eventually we will adopt definite national policies with a well balanced navy to enforce them; that succeeding administrations will work along the same lines as far as national protection is concerned; that the navy will be kept out of politics; that we will have a general staff composed of our very ablest experts; and, that eventually the manager of this great naval business will be a man of long experience in the naval profession—one who knows it in all its details.

The writer believes that few realize the pressure that will be brought to bear for a permanent world peace at the end of the war in Europe. The money spent at the end of another six months will more than equal the combined national debts of all countries at the beginning of the war. The war-ravaged countries, the widowed and orphaned, the loss of men by hundreds of thousands, are bound to have their effect. If the world's statesmen succeed in effecting an iron-bound treaty of peace that will endure—magnificent! If they fail in this undertaking, it is the sacred duty of those clothed with authority to *prepare for war as never before.*

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVY YARD ACCOUNTING.[1]

By PAYMASTER G. P. AULD, U. S. Navy

The system of accounting at industrial navy yards which was inaugurated six years ago is being revised under the direction of a special board appointed by the Navy Department. The revision is concerned chiefly with cost keeping methods. Navy yard accounting may be said to comprise financial accounting and cost accounting, these divisions, particularly the latter, being comparable to the corresponding aspects of a commercial system. Expenditures for yard labor and for stores issued to the plant are digested, on the one hand, as charges under the naval appropriations and on the other hand as costs per job or lesser unit. The results are placed before the Navy Department and the administrative officials of the yard in the form of expenditure reports and cost reports. The former serve as an accounting to the department for funds allotted and to the treasury and to Congress for funds appropriated. The cost reports are an accounting, by units of work, to the department by the manager, to the manager by the work superintendents and to the latter by the workmen, and in detail or viewed more broadly are calculated to serve a variety of useful purposes connected with the prosecution of future work. The records and methods of the accounting system must be so organized as to permit the preparation of statistics satisfying the financial requirements, and the determination of costs accurately registering the effect of all the forces of production and indicating the extent and location of wastes. The present cost system, valuable as have been its services, has serious defects. The accounting board has for several months been engaged in revising the classification of accounts and in preparing for a change in the methods of computing costs.

[1] This article was prepared in March, 1915.

A survey of the field is not inappropriate at this time, and in view of the trend of events in the navy yards such a survey should be of interest to the service at large, for cost accounting—or, for the purposes of this paper, accounting—occupies a much more significant place in navy yard affairs than has been generally understood. The intricacy of the present system, the multiplicity of its details, and the smoke of the controversies that have arisen between different schools have not tended to popularize accounting; they have, if anything, obscured its larger aims, in some cases from the eyes of those to whom it offers large opportunities for increased effectiveness of effort. All this is unfortunate, for sound accounting is important to the navy, and to secure the effective application of accounting, no matter how sound a system may be provided, its purposes and problems must be more widely understood and its possibilities more generally recognized by those eligible for duty in our industrial plants.

Fleet problems are more attractive to naval officers generally than shore problems, and they have, in consequence, received more conspicuous attention from the service at large. Fleet branches can never be regarded as of less than the first importance. But the problem of the navy yards, which exist to serve the fleet, presses upon us also, and it demands, in no uncertain terms, the earnest attention of those to whom its solution is or may be entrusted. Its responsibilities must be met or relinquished. Frequent changes in organization, rumors of civilian management and other straws make it plain that the question of the compatibility of industrial work with the vocation of a naval officer is at issue.

Accounting is inextricably interwoven in the question of navy yard reform. The record of the navy yards for the past six years shows that not only have both accounting and production made strides but that in no small degree progress in the latter has hinged upon the former. No organization has ever run itself efficiently and economically without proper supervision. In a small shop, the owner can perhaps be his own manager, foreman, storekeeper and accountant. But adequate supervision in a large plant is impossible without well developed systems devised for the purpose of performing these important functions. Thus we have our office, planning, material and shop systems, and as a check upon them all the accounting system, an intelligence department reach-

ing daily into every corner of the plant, making simultaneously in all departments such a comprehensive inspection as the manager would be able to accomplish in person only at infrequent intervals. The labor, material and expense facts searched out by this inspection are recorded, digested and put on view by the accounting department in the shape of costs.

Accounting is thus one of the most powerful, and rightly used one of the most useful, servants of the management. Its practical value depends mainly on four things: the scrupulousness with which its basic records—the time slips and material stubs upon which all charges are reported daily by the shops to the accounting department—are prepared, the soundness of the methods of translating these records into costs, the promptness with which costs are made available, and the care and judgment with which the cost reports are scrutinized by the persons responsible for production. Soundness of principle and speed of service are not sufficient. No matter how excellent the system, it must, like a municipal statute, rely on an informed and sympathetic public opinion—in our case the opinion of the officers of the navy—to make it effective. It rests with the officers of the administrative departments of navy yards not only to apply the final cost reports to the practical ends of process improvement and waste elimination but also to stamp out the tendency of shop subordinates, in preparing the primary papers, to specify jobs whose estimates are ample or accounts whose contents might be expected to escape notice rather than the jobs on which the labor and material were actually expended.

Habits of mind are the fundamentals in any human organization. The accounting habit of mind is the antithesis of that which actuates the ostrich when he buries his head in the sand. It demands facts and is ready to stand or fall by them. It has no illusions about cost manipulations, recognizing clearly that any seeming show of economy in one direction is offset elsewhere, and that nothing is attainable by such methods which will counterbalance the injury inflicted on the morale of the organization. To attain the accounting viewpoint—and no officer on duty at an industrial plant can afford not to attain it—one need not necessarily be on terms of intimate familiarity with the details of accounting department procedure, which in any large establishment is necessarily somewhat complex and which in the navy yards

is especially so through the necessity of clearing the cost records into the unrelated and extensive appropriation classification prescribed by Congress. If one will examine merely the main features and purposes of navy yard accounting, past, present and proposed, he can hardly escape the acquisition of the accounting viewpoint.

Prior to 1909 the system of accounting in the navy yards was primitive. "Costs," at their best consisted mainly of such wages and material as were directly applied to an article or a job. Miscellaneous expenditures for shop and plant maintenance, etc., no matter how obvious their service to production, were as elements of cost almost entirely ignored. "Costs," being at their best meaningless, there was little incentive for taking care that the right jobs were charged with the right amount of direct labor and material, and the results were frequently amazing. Moreover, as the miscellaneous objects upon which a third to a half of the force is employed were not properly classified and consequently not subject to proper scrutiny and control, operating efficiency was well nigh hopeless of attainment.

It finally became recognized that the miscellaneous charges—expense in other words—should be classified and that a considerable portion or all of the expense of maintaining the industrial plant, as distinct from the military organization, should be shown in the cost of work. Pay Inspector John A. Mudd and Paymaster Charles Conard interested themselves in the subject and from 1907 to 1909 they were engaged in investigating the accounting methods of some 20 of the largest establishments of the country, and in working out a proposed system for the navy. In 1909 a firm of public accountants was called in, the original plan which had contemplated charging work with practically all of the industrial expense was modified, and the new system was put in operation by the department at the so-called industrial navy yards, the consolidated accounting organization being placed in charge of officers of the pay corps.

Before undertaking to examine the salient points of our present accounting system and to arrive at an understanding of its weaknesses, it is well to bear in mind that the product of a navy yard, operating as an industrial plant, comprises not only manufactured articles, but also new ships and repairs to old ones, that both hand work and machine work are done, and that the equipment is necessarily of a very diversified character. These considerations,

it will be pointed out, make the determination of costs less simple than in a plant equipped for and turning out a more uniform product. We should also bear in mind that the navy yards are equipped for a maximum capacity averaging about double that at which they are normally employed. This condition, whether or not it be partially due to political considerations, represents in fact, as regards government ship-yard facilities, the national preparedness for war. In the extra expense attaching to the yards on this account we have another element that demands special consideration when we undertake to determine costs.

Finally, before going further, it is desirable to attempt to define "cost" and "expense." The cost of an article or a piece of work depends upon the stage from which viewed; for example, the cost of it as a finished product or the cost at the point of delivery with selling expense, etc., included. "Prime cost," *i. e.*, total value of the labor and material directly applied is, on such a basis, not an actual cost at all at any stage, as indirect elements enter into every piece of work from the moment it is undertaken. At any stage, therefore, the cost of a unit of output may be defined as the measure, in terms of value, of all the forces which have been directly or indirectly applied to it. Although the navy yards have no selling expense the presence of the element of extra expense referred to in the preceding paragraph makes it desirable, as will be pointed out in the course of this paper, that two stages of navy yard costs be recognzed, viz, "net cost of production" and "total cost."

The elements of cost are thus direct labor, direct material and indirect expense. Indirect expense, variously known as expense, overhead or burden, is the charge for indirect services incurred for the purpose of facilitating production but not susceptible of being directly located to specific jobs and to their production cost. For example, it is impracticable to measure the supervision, power, oil, grease, etc., delivered to a specific job and it is impossible to charge it directly with its proper share of repairs to tools, of janitor service, of heat and light, of office expense, of planning, of maintenance of water system, etc. This is not to say, however, that a more or less definite sum of money was not thus expended, either properly or wastefully, in the interest of the specific job, and that the job should not be required to acknowledge and pay its consequently more or less definite share of this expense.

A proper cost system will measure the elements of cost with reasonable precision. With the co-operation of the shop organization, it is not difficult to measure accurately the direct elements. For the distribution of expense, a system must be adopted which will determine as definitely as is practicable each job's share of the total charge. Various methods, known as the percentage-on-wages plan, the hourly burden plan, the machine rate, the combined machine-hour rate and supplementary rate plan, etc., have been devised to accomplish this end, all of them based, necessarily as will be pointed out later, on a distribution of estimated rather than actual expense. The sounder the system, the more nearly we come to true costs—to laying bare the actual production performance in its entirety and thus possessing ourselves of the power to pass upon the necessity of the expenditures and to more effectively control and thus to improve production methods. An incorrect distribution of expense not only fails to disclose the facts as they actually occurred, but also presents to us under the semblance of fact statistics that are false and misleading. The question of proper expense distribution is, as Mr. A. H. Church has said, not merely theoretical and pedantic. "These shop charges frequently amount to 100 per cent, 125 per cent, and even more of the direct wages. It is therefore often actually more important that they should be correct that the actual wages cost should be correct. If we have to put a dime and also a quarter in a certain collecting bag, it is certainly more important that the quarter should not go astray than that the dime should be looked after."[1]

Under the present system, the yard is divided for accounting purposes into two main sections—the military and the industrial, the activities of the latter being "industrial in character though military in purpose." The expenditures for the maintenance of the purely military activities, such as the receiving ship organization, fleet supply system, tugs, courts, boards, the medical department and the marine corps organization are separately charged. The remaining expense, though logically industrial, is not all classed as such. Certain kinds of expense, viz., the salaries of all officers engaged in industrial work, the maintenance of their quarters, and the store keeping expense pertaining to materials used in industrial work, are arbitrarily classed as mili-

[1] "Expense Burden," by A. Hamilton Church. New York; The Engineering Magazine Co., 1913.

tary. This relieves the cost of work of a certain portion of the burden it would otherwise bear, and is in effect, though not in treatment, a means of making allowance for the undue expense incurred at navy yards for maintaining a larger equipment than is ordinarily required. This allowance is increased by writing off a portion of the net expense classed as industrial. Dry dock expense, the salaries of the clerical force, and the cost of leave, holiday and disability, do not appear in the cost of work, being separately charged to annual appropriations. Such expense as maintenance of buildings, tools and equipment, maintenance of the transportation, water and sewer system, etc., is an overhead charge to the cost of work, but any item of repairs estimated to cost more than $25.00 ($100.00 for repairs to machine tools and floating property) is omitted from the cost of work, being separately charged to an annual appropriation.[2] Furthermore, the items which exceed the "expense limit" take with them, as an overhead burden on themselves, part of the net shop and plant expense— thus further decreasing the overhead charge to plant output. No charge is made for depreciation.

It will be pointed out later that the general principle of setting off from production costs the expense due to maintaining excess equipment, if it can be scientifically applied, is a correct one. It is unnecessary to dwell upon the fact that any accuracy or inaccuracy of results obtained by present methods is purely a matter of chance. Considering the fact that depreciation, interest, insurance and taxes are not charged, the amount of expense written off appears to be very generous; on the other hand analyses made by the accounting board indicate that it is too small. (See footnote on page 1429).

There are a number of admittedly weak features in the above scheme that should however be noted at this point. In the first place the detailed classification of accounts under the plan roughly sketched in above is much too complicated. There is no consistent scheme of arrangement running through it. Charges of much the same nature go to a variety of heads heterogeneously named and

[2] It was the original intention that repairs costing in excess of the limits named, should, after segregation in this way, be reflected in the cost of work by a depreciation charge. Although the depreciation charge was abandoned, the repair items were not restored to the cost of work.

numbered. There are ambiguities in the instructions which are inherent in the scheme itself. For example it has been found impracticable to lay down any consistent rule as to what constitutes a single item of repairs. Whether the simultaneous repair of two power plant boilers, estimated at $20.00 for each boiler, constitutes two items of overhead expense or one item of "appropriation expense" is of course capable of being decided, but with a multiplication of questions of this sort, covering operations, as well as objects, of varying degrees of affinity, uniformity of interpretation is practically impossible. The charges to expense have consequently not been uniform at all the yards. Another weakness of the above plan, or more properly of a policy of paying undeserved attention to its results, is that a yard running at low capacity is at a disadvantage in competing for work against a yard running nearer its maximum, through the higher costs which the methods above described saddle on it. These methods make an adjustment in the determination of costs, which is, in effect, an allowance for enforced idleness, but this allowance expands and contracts, not with the variation in extent of idle equipment or its complement the volume of work, but simply with the increases or decreases in expense. The two fluctuations are not the same; due to the presence of a more or less fixed charge, reduction in expense does not keep pace with reduction in output and costs consequently go up as production shrinks.

Having arrived at a net total expense chargeable to the plant output, the present system distributes the charge to specific jobs and units of output on the "percentage-on-wages" plan. Each shop has a separate percentage which is applied to the labor charge of every job upon which the shop force does any work. The amount produced by this computation is charged into the cost of the job as "indirect." The "shop percentage" is periodically fixed at such a level as is estimated to produce, in a month's time, a total charge to all jobs which shall be equal to the shop's actual outlay for expense objects (including its share of the general plant expense). All jobs are finally charged to the appropriation having cognizance of the work; consequently if at the end of the month the total indirect charged to jobs is, by reason of the percentages having been fixed too low, less than the amount of the expense actually incurred, the money accounted for under the appropriations will be less than the money actually spent. The

difference, known as the unabsorbed expense, is then prorated and separately charged to the work appropriations; conversely, if the actual expense has been overabsorbed, the appropriations are credited accordingly, the job costs being in neither case affected.[1]

It is obvious that in a plant of diversified equipment and doing both machine and hand work, the percentage-on-wages method of distributing the overhead burden to jobs is inequitable. For example, hand work, which constitutes half of all navy yard work, is charged on the same basis as machine work, and thus pays for a portion of the power, machine repairs, etc., which actually went into the machine work exclusively. The expenditures for power, repairs, heat, lighting, oil, grease, etc., and the depreciation charge, which our present system ignores, bear no relation in fact to the labor charge on a job, but are proportionate to the power rating, size, cost and life of the utilities employed, and the remaining items of expense can be distributed to the job as equitably at the tool point as by way of the workman. The producing unit, *i. e.*, the machine tool, the portable power tool or the hand outfit is thus the logical point of incidence of expense to work. Expense having been carefully analyzed from this standpoint, its reduction to an hourly basis apparently offers the most equitable method practicable of making the charge to the job. If the method of determining the volume of expense delivered at the point of effort is changed from an arbitrary one to an analytical one, such as outlined above, much will be accomplished toward correcting the present large errors in charging specific jobs. Such a change would do away with the crude methods of writing off *in toto* various kinds and amounts of expense for the purpose of determining what total burden on navy yard work is a fair one, since the expense actually incurred for the maintenance of idle tools would be automatically set apart, being unabsorbed by reason of there being no job to receive the charge, and would constitute

[1] Since July 1, 1914, the shop rates have not been calculated to absorb the expense. An attempt has been made to approximate the amount of the charge which under the impending revision of the accounting system will be scientifically determined as incident to actual production. The rates have therefore been fixed semi-annually at 72 per cent of past ratios of actual expense to labor. This has tended to increase the unabsorbed expense.

a definite measure, scientifically arrived at, of the amount of expense not strictly incident to production.

Despite the defects of our present accounting system, it would be a serious mistake to assume that it has accomplished nothing. It has on the contrary rendered extremely valuable service, both tangible and educative. It has, among other things, resulted in a reduction of the period required for completion of monthly reports of expenditures from two or three weeks to as many days, and sometimes less. Bearing in mind the importance to the department of prompt notification of expenditures and the extent and exacting nature of the work of compiling these reports, this alone is to be regarded as a considerable achievement. As a cost system it turned the light on a portion of yard expense and has opened up its details for examination. It has furnished prompt cost returns of all jobs and has maintained comparative cost records of manufactured articles. Noteworthy improvements were effected in power and foundry accounting. The numerous time- and cost-sections formerly existing in each industrial yard were abolished and a centralized accounting organization, which is well trained and capable of wide usefulness, has been developed.

The faults of the system have been largely due to the unpreparedness and incoherence of navy opinion existing at the time of its installation. There were some who favored charging to or at least showing in the cost of production all of the elements of industrial expense; there were many other shades of opinion ranging down to those who took little stock in any cost system at all. To secure the installation of a system compromises were necessary. These compromises were not happy. The devices employed for carrying them out were unscientific and the so-called costs which they have developed have been, owing to their heterogeneous construction, insusceptible of interpretation or comparison with any standard. It has only been through the trial and operation of the system, however, that its faults have been made apparent to us. It has educated us to a desire for something better. It has, in large measure, been responsible for the birth and gradual growth of a navy opinion that demands cost *facts* and that recognizes the power for good which comes from possessing them.

Before passing to a consideration of how it is proposed to remedy the faults of the present cost system, we should, per-

haps, restate our conception of expense and consider what is to be accomplished by undertaking a more accurate distribution of it. Expense, except such avoidable waste as with improved methods will tend to disappear, may be defined as the indirect outlay incurred for the purpose of making possible the proper prosecution of work in process or in prospect, possibly remote. This holds true whether it be voluntarily incurred or, as in the case of depreciation, its incurral is automatic, since in the latter case the utilities with which the plant is equipped for the purpose of doing work contribute day in and day out a part of their useful life and value to this end. Expense incident to work in prospect is incurred when the plant is running at less than full capacity and is the cost of maintaining the idle equipment. In a commercial plant, it is important that this expense be segregated from that incident to actual work. If it be so segregated, the management will be in possession of full and accurate knowledge of the cost of the processes which actually entered into the product and can be governed accordingly in marketing it. The expense due to unemployed capacity being distinctly set forth will also be definitely known and can be intelligently taken care of as conditions may dictate. Market conditions may be such that it can be wholly or partially recovered in the selling price of the output. Or, the idleness may be temporarily relieved and the loss partially recovered by taking orders for work at a price which though apparently less than cost is actually profitable when the automatic and unavoidable expense which would go on if the utilities were unemployed is deducted. What is not taken care of by one or other of these methods must be charged to profit and loss. If, by reason of permanently altered trade conditions or by reason of the unemployed equipment being inefficient, it appears that a loss of this nature will be consistently incurred, steps can be taken looking to the disposal of the superfluous utilities. Whichever one of the measures mentioned be adopted, definite knowledge as to the extent and location of the loss is of the greatest value to the management.

In the navy yards the segregation of the two kinds of expense is equally important. There are many points of difference between the conditions existing in civilian plants and those confronting the navy yards, but the main considerations are much the same. We have, it is true, no responsibilities as to paying dividends and we

are not troubled by possibilities of insolvency, but our obligations as stewards of the nation's interests are or should be equally compelling. Holding such a conception of our obligations, we must have accurate knowledge of production costs. The power that comes from such knowledge to control production and thus to improve processes and to effect economies cannot be questioned. No right-minded apologist for economy desires to see it effected at the expense of the quality of the output. But, in view of the more or less commonly admitted extravagance of navy yard work and in view of the impressive extent of the field of effort,[1] it would be a rash person who would assert that nothing worth while, whether in reduction of outlay or in increase of output, can be accomplished without "jeopardizing the results." Coming to the subject of idle utilities in navy yards, the question of recovering, by means of more work, some of the expense entailed by their maintenance is an important one to the government. The problem of curtailment of plant capacity depends for its solution on the extent and nature of preparedness for war conditions which are desirable. None of the navy yard problems mentioned can receive the consideration which they merit without the circumstantial information which would be made available by the proper segregation of the expense of doing work from the expense of not doing work.

The system now being developed by the special board on accounting—Captain B. C. Bryan, Paymaster D. V. Chadwick and Naval Constructor W. B. Ferguson—is designed to accomplish this segregation scientifically by means of a machine-hour rate constructed with this end in view. Under this system the expense distributed to cost of production by the machine-hour rate will be the portion actually incident to production. The remaining expense will be the cost of maintaining idle utilities and, if desired, is distributable to jobs as a separate item by the so-called supplementary rate. Under this plan, therefore, the two kinds of navy yard costs may be shown, viz., net production cost and total cost, the latter being the basis upon which a private concern would fix the selling price provided market conditions would permit them to recover in this way their idle time expense.

[1] The expenditures for labor and material at the so-called industrial navy yards for the year ending June 30, 1913, amounted to $33,000,000. See page 1 of statement B, table 1, report of the paymaster general of the navy for the fiscal year 1913.

The new system also provides for a revision of the operating and maintenance accounts to which actual expense is chargeable as occurring, substituting a simple and logical classification for the present heterogeneous arrangement, and providing for the first time a single set of accounts where all such charges will be lodged and may be readily examined.

The application of the machine-hour rate and supplementary rate method—the Church[5] plan—presupposes an appraisal and scheduling of the industrial plant by individual "production centers," *i. e.*, machine tools, portable power tools and hand outfits. An hourly expense charge—the machine-hour rate or perhaps more correctly called the producing unit rate—having been determined for each center. either separately or averaged for all centers in a group of similar units, the distribution of expense is accomplished by assessing each job the rate (which is expressed in cents) of the center employed on it for each hour of employment. The machine-hour rate is the sum of the estimated hourly charges for the various indirect "factors of production"—power, heat and light, supervision, stores-transport, building and land, office expense, and depreciation, repairs, etc., of tools and equipment. Plant utilities which are merely accessory to production are rated as production *factors*. Service departments such as the power plant and transportation system require adequate separate systems for determining the cost of their maintenance and operation, but they are not rated as centers directly producing the main output. So far as the latter are concerned, the power and transportation systems are indirect factors only, and the cost of their maintenance and operation, expressed in the unit price of output, or otherwise, is distributed to the production center rates and paid for by the jobs upon which the centers are employed.

The machine-hour rate is an estimate of the producing unit's hourly share of the estimated total plant expense incurred when all units are occupied full time on average work.[6] This is the

[5] "Production Factors," by A. Hamilton Church. New York: The Engineering Magazine Co., 1910. See also, Chapter XIX of "Accounts: Their Construction and Interpretation" by W. M. Cole, A. M. Boston: Houghton, Mifflin Co., 1908.

[6] No machine can of course be actually operated full time. The occupied time includes the running time, the time required for setting up the work and adjusting the machine and the normal intermissions in handling work.

operating condition for which the plant is equipped and is of course its most economical one. As our navy yards are normally run at 30 to 60 per cent full capacity, our normal expense consists of the fixed charge for maintaining all utilities plus the expense of operating 30 to 60 per cent of them. Since the rate of any specific center will be utilized for the distribution of expense only when the center is employed, the determination of all rates on the basis of 100 per cent activity is perfectly logical. It simply means that the fixed charge is divided among all the units, whether normally active or not, and that the estimated operating charge is included in the rate of each unit against the time when that unit shall be employed. Such a distribution of the fixed charge ensures that a working unit since its service to production undergoes no actual change by reason of the idleness of its neighbors be not penalized for their maintenance, and that the unit when idle may carry its own depreciation and share of the other elements of the fixed charge into a separate item, called the cost of idle time, the loss due to unemployed capacity, or war insurance, as may be preferred.

When the plant is running at less than full capacity, the sum total of all the machine-hour rates applied to job orders will fall short of the actual expense by the amount incurred for the maintenance of idle utilities. The actual expense thus unabsorbed is the total cost of idle time. If this be prorated to individual job orders, we make use of the supplementary rate, which may be fixed on the basis of the ratio of the total idle time expense to the absorbed expense. A commercial concern as has been pointed out might be under the necessity of charging this element to profit and loss, in order to avoid inflating their selling price beyond what it would bear.

The objections that have at various times been urged against the installation of a commercial system of determining costs, such as is now contemplated, except that taxes and interest are to be omitted, are in the main that the appropriation acts do not permit it, and that conditions do not warrant it. So far as the statutes are concerned, the Act of June 24, 1910 provided:

The average running time is estimated at 20 or 30 to 80 or 90 per cent of the occupied time, depending on the machine and the class of work. This is borne in mind in estimating the power consumption upon which the power factor of the hourly rate is based.

"That in fixing the cost of work under the various naval appropriations, the direct and indirect charges incident thereto shall be included in such cost."

The detailed phraseology of the appropriation acts has in many cases been repeated year in and year out from a time long long anterior to the passage of the Act of June 24, 1910. To interpret this set phraseology as superior to the special provisions authorizing and requiring the charging of overhead expense would be to construe these provisions as having no meaning whatever. Under such an interpretation merely the phrases "Coal and other fuel; . . . . Attendance on Light and on Power Plants" which have been repeated for many years under the appropriation "Maintenance Yards and Docks" are sufficient to vitiate any attempt to arrive at real costs. Overhead costs that ignored the power element would be ridiculous. Yet this would be the situation if fuel and attendance were charged to a maintenance appropriation instead of being charged to, and digested in a system of power accounts and thence charged, on the basis of consumption, to the plant output under the work appropriations.[1]

[1] Since the preparation of this paper the department has adopted a procedure recommended by the accounting board whereby the apparent inconsistencies existing between the appropriation acts and the laws relating to the distribution of overhead expense are reconciled. Except in the case of articles manufactured, which for purposes of invoicing are to carry correct cost prices, it will not be attempted to clear the cost records as such into the appropriation records and reports. So far as the latter are concerned, maintenance charges will be located to the appropriations designated by Congress, such items as are not clearly specified in the acts being equitably apportioned in accordance with a special provision of law appearing in the Act of June 30, 1914.

In the cost of work records all indirect charges will be distributed to jobs in accordance with the requirements of the cost system herein described. The appropriation system will thus no longer be required to perform an impossible service, *i. e.*, to do duty as a cost system, and the latter may be perfected so as to include such items as pay of officers and clerks, etc., without attempting to divert them from the appropriations under which provided to the appropriations under which productive work is done. Depreciation, an unmistakable element of cost, can also be included, since no charge will be made to appropriations for this item and the lack of any statutory provision for the setting up of a depreciation reserve fund for renewals will consequently be no stumbling block, the cost system being devised simply to answer the question "What is the cost of work?"

It should be noted that the installation of the new cost system is being accomplished step by step. Plant inventories and appraisal occupied some

The argument that navy yard conditions are so dissimilar to conditions existing in other plants as to render misleading and unfair the comparison which would result from the installation of commercial accounting had its strongest justification in the feeling that a considerable portion of the maintenance expense was not incurred in the interest of production but rather as a measure of national defence. This objection will be satisfactorily met by the new system, whereby for the first time expense of this nature will be accurately set forth and segregated. The remaining objections put forth by this school have been summed up and disposed of by Paymaster Conard in his valuable paper on Navy Yard Economy,[8] from which the following is quoted: "It is frequently stated that government plants work under a serious disadvantage as compared with private concerns, in that the former have expenses which the latter do not have to meet. The examples most frequently quoted are the eight-hour law, payments for leave, holiday and disability, and higher rates of wages. . . . . But let us now consider certain items with which private plants must be charged before their product can be delivered to us as consumers, and which are not charged to our plants. These are interest, taxes, legal expenses, advertising, selling expenses, dividends on stock, and many others. . . . . The foregoing will serve to show that many of the claims advanced in connection with high government costs, will if analyzed find offsets in private costs, and that there is still 'a fair field and no favor.' As a matter of fact it will be found after thorough examination that the ordinary expenses of a navy yard plant will be closely similar to those of the usual industrial plant of the same caliber. That is assuming of course that the purely military expenses have been properly segregated, a problem of no great difficulty when carefully studied."

Under the new system the maintenance of the purely military activities of the yard will continue, as heretofore, to be separately charged. The military element existing in mixed military-indus-

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months. The next step was the adoption on July 1, 1915 of a simplified and standardized system of expense accounts. The next step will be the fixing of hourly rates and their utilization as the basis of expense distribution.

[8] "Navy Yard Economy" by Paymaster Charles Conard, U. S. N. Prize Essay. U. S. NAVAL INSTITUTE PROCEEDINGS, March, 1911.

trial activities such as storekeeping will be determined by analysis and written off. All that remains is treated as industrial expense entering into the total cost though only a portion of it as incident to the net cost of production. The new system thus offers to two hitherto irreconcilable schools of navy accounting a treatment of industrial expense that should satisfy both. The net production cost—labor, material and the machine-hour rate—should commend itself to the one; the total cost—net cost plus the supplementary rate—should satisfy the other. No one, presumably, will condemn the abandonment of the arbitrary devices of writing off expense in lump and of distributing the remaining burden on the basis of wages. Furthermore, the new classification of expense accounts will by reason of its conciseness come as a great relief to the officers, clerks, foremen and leading men who need a working knowledge of the headings to which actual expense must be charged as occurring.

That those heretofore holding opposing views as to what constitutes navy yard costs will perhaps unite in approving the new system augurs well for it. This does not mean, however, that its installation will not be attended with difficulties or that its virtue will be such that once set in motion it will run triumphantly on without attention or adjustment. The intelligent co-operation of many persons will determine its success.

Accounting officers must devote themselves to the development of their intelligence service along the lines best adapted to the needs of the management. There is a wide field of usefulness for navy yard cost accounting which has as yet hardly been touched. Cost comparisons of and estimating on repair and new construction work are attended with great difficulties, owing to the dissimilarity of jobs. To whatever extent standardization of the elementary operations into which such work is divisible becomes a fact, accounting should keep pace with detailed cost reports.[1] Costs by detailed operations when not standardized should also be furnished when in demand. Statistical machines, employing the punched card principle, such as have been installed in the accounting departments of several yards, offer a solution to the labor problem involved in these and other extensions of accounting service, ensuring in fact a net decrease in accounting department expense.

[1] See "Estimating the Cost of Work" by Naval Constructor W. B. Ferguson, U. S. N. New York: The Engineering Magazine Co., 1915.

There are three machines in an installation, viz., the punch, the sorter and the tabulator. The two latter automatically sort and tabulate at a high rate of speed cards previously punched to indicate the data received on the time slips and material stubs. The sorting process eliminates not only the manual sorting of slips and stubs but also renders unnecessary thousands of manual postings, as the cards form a permanent record of charges capable at any time of being speedily tabulated for any period and for any characteristic, such as month, day, appropriation, title, job or account, operation, workman, machine and shop or group.[10]

Accounting officers must also carefully scrutinize and adjust the machine-hour rates to accord with facts so that neither will production be overburdened, nor on the other hand, due to too small rates, will the unabsorbed expense carried to the supplementary charge contain too large an element foreign to the cost of idle time. Too great refinement in fixing rates will at first not be attempted—the same rate will be used for all the units of a group.[11] Error cannot be entirely eliminated in fixing the machine-hour or group-hour rates; they are merely estimates and must remain fixed over a considerable period, for in no other way can expense be properly distributed to current jobs.

An attempt to distribute to jobs the actual expense as occurring would be met by a number of practically insuperable difficulties. In the first place, indirect expenses, even if the actual charges

[10] Machines of this type were used for the compilation of the United States census of 1910 and are widely used in civilian establishments such as the Newport News Shipbuilding Co., Pennsylvania Steel Co., United Shoe Machinery Co., General Electric Co., and scores of others. A more detailed description of them and of their scope appears in the volume "Graphic Methods for Presenting Facts" (by W. C. Brinton. New York: The Engineering Magazine Co., 1914) from which we quote: "The very great flexibility, speed and accuracy of these machines make them almost indispensable in any work where there is a large quantity of complex data to be analyzed. It has been found feasible and profitable to use machines of this type in businesses of only moderate size."

[11] "It will probably be some time before an extended use of the refined methods outlined by Mr. Church is realized; but a machine rate for classes or groups of machines can be readily applied, and is in fact in common use, and there is no doubt but that this method in connection with the supplementary rate offers the best solution of the problem for most plants of diversified equipment." "Principles of Industrial Organization," by Dexter S. Kimball. New York: McGraw-Hill Book Co., 1913.

were utilized for the purpose, could not by their nature be definitely assessed against individual jobs except on the basis of an estimate—if they were capable of such definite allocation they would not be an overhead charge at all, but would be charged direct to jobs as labor and material. Furthermore, such expense charges as those pertaining to power and transportation are meaningless until transformed into unit costs, and the process of collecting the necessary data and digesting the charges would assume prohibitive proportions if attempted oftener than monthly. Finally, the assessment to individual jobs of actual expense, as occurring, would be inequitable. Expense fluctuates from day to day and from month to month. The service which it renders is however in many cases effective over a much longer period of time than the day or month in which the expense is incurred. For example, the benefit of repairs to a machine which might be made and charged in the course of a few days would be felt for months, and rates should be averaged over the longer period so that future jobs handled by the machine will be required to pay their share of the cost of making it serviceable."

The elements of the machine-hour rate are estimated by various methods whereby for most of the items a fair degree of accuracy can be attained, and as performance records become available the error can be reduced. Large errors in rates due to improper estimates or to extensive plant rearrangements should be corrected as promptly as practicable. But, in general, frequent changes should be avoided, for a number of reasons, notably the uncertainty which would be encountered in estimating on work and in instituting cost comparisons. It is not worth while that expense rates should reflect periodic fluctuations, such as the difference between summer and winter charges for heat and light, which recur regularly within the same year.

For the production superintendent and the management the scrutiny of the indirect elements of the net production costs and of the total costs will have great value in the light it will throw

" In the field of municipal finance, the correctness of this principle, conversely applied, was recently pointed out in the *New York Times* by Mr. Charles Whiting Baker, editor of the *Engineering News*. Mr. Baker calls attention to the injustice of the burden saddled on future taxpayers by the prevalent practice of issuing long term bonds to pay for short lived highway improvements, etc.

on operating expense, on the handling of work and on the suitability of machines, taking into consideration the requirements of work and the drain which their maintenance entails. The accounting department records of expense by producing units will, in addition to their bearing on the fixing of rates, furnish to the administrative officials a valuable index to the wastes and cost variations due to over-, under-, or irregular expenditures for maintenance.

The Navy Department will for the first time be put in possession of cost data capable of comparison by yards. In awarding work and in measuring results the department can put the yards on a competitive basis which will be fair, as lack of work and heavy fixed charges will no longer inflate production costs at one yard over those of neighbors operating under more favorable conditions.

Navy yard statistics have heretofore been unintelligible even to ourselves; it has been unwarranted assumption if we have expected Congress to find them convincing or to obtain from them a clear cut idea of navy yard conditions and needs. Under the new system our reports can hardly fail to impress Congress as lucid and unequivocal. Furnished with true production costs and a rational statement as to the cost of maintaining idle utilities, Congress will be in far better position than now to determine where work should be done, to pass on or to undertake development projects, and to consider the frequently recurring question of how many and what navy yards should be maintained. The new system will make it clear to Congress that we can do more work at a small increase in expense over the fixed charge. Should our production costs be shown to be high, the same circumstantial information that will carry such a message to Congress will be a weapon in our own hands for the elimination of wastes. Whatever the facts may show, we may be encouraged to believe that development, retrenchment and flow of work will become more even, and we should feel considerable satisfaction in at last laying all the facts clearly and candidly open to the scrutiny of those who are entitled to have them and who are likely to utilize them for the best good of the nation.

It would be idle to assume that the new system will not have its vulnerable spots. In general, it must bespeak the friendly interest of all to protect its basic records. An enlightened shop practice

must frown on the juggling of charges. The particular points where this is apt to be most tempting do not yet appear. But neither did it appear to the public accountants employed by the Navy Department in 1909 in just what form this kind of attack would fall upon our present system, if we are to judge from the following comment on the expense limit device:[13] "It has been stated that by setting this limit .... the officers in charge of the different shops may evade paying for expenditures from their appropriation by splitting the work over several jobs and charging it to shop expense." It was apparently unforeseen that overhead charges would often be regarded as a skeleton to be hidden in the closet, that the institution of competition between yards, based on statistics that under the system now passing have been essentially incomparable, viz.: the overhead costs of yards of unequal plant valuation and output, would make it highly tempting to "soak the appropriation" and "save expense" by accumulating repairs to a point over the expense limit through grouping of units or through mere delay.

Those who realize that money is not really saved by mere bookkeeping devices and that even an actual saving of money, attractive as it is, often means the loss of something more important, will watch with sympathetic interest the development of a system which seeks to show facts as facts and to aid in establishing the only true measure of economy, viz., the ratio of expenditures to results.

[13] "Accounting and Cost Keeping System of the United States Navy," by J. Mendenhall, C. P. A. *The Engineering Magazine*, March, 1911.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE NAVAL BASE AT KEY WEST IN 1898

By COMMANDER REGINALD R. BELKNAP, U. S. Navy

One cannot study the composition, administration, movement, and use of a fleet's train; nor picture the activity at an advanced naval base during the hurried visit of a naval force; nor, above all, consider the procedure necessary for making all of a train's resources immediately available wherever the fleet may stop en route and demand them, without becoming interested in the question of how to organize to meet these many requirements. Some personal experiences at Key West during the war with Spain have suggested themselves in this connection, they having made a strong impression at the time. Safe to say, the conditions of that war will never be repeated so far as the supineness of the enemy is concerned. It is imperative, therefore, that the unmilitary, at times almost paralyzing, conditions then prevailing in our midst shall not, for lack of recognition and remedial preparation, again arise, to bring disaster upon our forces when again under the stress of war-time activity. A brief account of some features of the work at Key West may give some useful hints, and it certainly should not wholly fail of interest, since no previous account, official or unofficial, has ever been published.

Had the Spanish War armistice of August 13, 1898, not been followed so quickly by demobilization of the Key West base, a report could have been written of the operations at that base which might have contained much information of future military value. As it was, pressing current work left the base staff no time for the preparation of a report; and upon the pressure ceasing, these officers were at once dispersed to other duties. Consequently, in the official history of the war, the work of the naval base at Key West is all but ignored. The following account

of experiences there is written from recollection, supplemented by a few notes, of which copies are attached. At the time, I was an ensign of nearly five years' service, one of which had been spent at the War College, a fact which often caused wonder why some things were done or why some questions were asked from Washington, which I knew had already been well considered and answered at the college. It had long been in mind to write this account, and a recent study of logistics made the occasion.

On May 7, 1898, Commodore George C. Remey, with Lieut. John H. Shipley as flag lieutenant, arrived in Key West, hoisted his broad pennant on board the monitor *Miantonomah,* Capt. M. L. Johnson, and assumed the superior naval command at Key West afloat and ashore. A week later, May 14, I was detached from the gunboat *Newport,* Comdr. B. F. Tilley, and reported to the commodore as his secretary.

This was three weeks after war had begun, but no preparations nor facilities had been made for a superior officer at Key West. Temporarily, the office of the light house inspector was borrowed for use, the inspector, Commander Cornwell, having joined the blockade. From somewhere a marine orderly was obtained as messenger. There was no telephone. We borrowed stationery and a typewriter from the inspector's clerk. The office was in the Federal Building, which stood always open, in charge of a watchman. Our offices were locked at night, and he kept the key. The one cipher code belonged to the commandant of the naval station, Commander Forsyth, and was kept in his house, under his bed. The house stood open, day and night, and as the commandant had no family, access within would have been quite easy for a stranger. In the many times I went to get the code, only once did I encounter a single person in the house. That was the commandant himself, who lay reading long after midnight. So accustomed had he become to intrusions at all hours everywhere, my entrance and dive under the bed caused him no more than a glance of recognition. With no orderly nor other guard on the premises, for an intruder to sandbag, throttle or shoot the commandant and escape, would have been easy.

My first day on duty was the last one for three weeks on which both Lieutenant Shipley and I had three meals. There being no quarters afloat, we had to find them ashore, and rented a pair of adjoining rooms with a bath in a private house in Key West and

took our meals at Mme. Bolio's eating house, opposite the crowded Key West Hotel. I can to-day repeat that bill of fare, word for word. Incidentally, I may mention, as bearing on the question of physical condition, that drinking the shore water nearly disabled both staff officers in two days, before we discovered what the trouble was. Dr. Wasdin, of the marine hospital service, prescribed tea, and the trouble disappeared. Generally we could start the day fair with breakfast at 7. Office hours began at 7.30 a. m., and finished between 10 and 11.30 p. m. One of us always got off for lunch, but almost invariably one missed either lunch or dinner. We had no clerk, not even to run the press-copy; no office help but one naval cadet for a few days.

After the day's work had finally been disposed of, we would take turns on the night duty. The Strategy Board in Washington would complete its labors in time for their cipher man to get a message down to us by 1.30 a. m. Almost as regular as the clock, the telegraph messenger would at that hour rouse the whole neighborhood, thundering on our front door. After a while I, the lighter sleeper, would hear, go down and get the message, then wake Shipley, if it were his turn, or else go down to the office and translate it myself. Messages came from all directions, and three times in a night I have got up and gone down to that office—only to find the message of no urgency. Once as I sat translating one, three more messages were brought in, one after another, keeping me nearly two hours steadily at work. Frequently, immediate action was necessary; and then one of us had to go out to the commodore, who lived on some ship in the harbor, and then to some other ship with orders, or back to the office to encipher a dispatch. One early morning a message received at 3 o'clock kept me on the go until 8.30.

By 6 o'clock every morning the fierce mosquitoes of Key West and the dazzling tropical sunlight made further sleep impossible, no matter how little rest one had had. So it was not difficult, after a bath, to be in the office again by 7.30. After three weeks of such unnecessary discomfort on shore, the old *Lancaster* came in and we all moved aboard. There the prospect of rest at night seemed better. But unfortunately, despite all I could do, my bunk was persistently shared by intruders; and whether or not telegrams disturbed me, these little bedfellows always did, two or three times every night. The result was, by morning I was so

heavy with sleep that it would take the boy 15 minutes to get me out of bed. This procedure lasted three months, during which I had not a single unbroken night's rest, coupled with continuous, confining office work averaging 14 hours a day. The pressure of the work, however, its interest, and the celerity of its dispatch acted as a powerful stimulant. An hour after the day began, the feeling of fatigue would have worn off and it was possible to keep at work all day, and day after day, with undiminished speed and accuracy. All the cipher work, for instance, was done with but a single minor error, in the whole three months. Had I been considerably older than I was (27), or had the same pace continued much longer, the strain might have told on the work, as well as on me.

The foregoing details are rather personal to be so lengthy, but I mention them as bearing on the number of staff officers that a base commander and a flag officer must have, for a protracted campaign. War conditions require an officer's best powers. Staff officers can seldom work in watches to good advantage. The majority must be continuously at work or on call; and to avoid deterioration through overwork, their numbers must be sufficient from the start. A staff officer familiar with his work is a mine of information, much of it not to be found in any file case, however complete. To lose an experienced staff officer in the midst of a campaign might be a great inconvenience in the flag officer's work.

The base office was established just as all forces were concentrating towards Key West, after the bombardment of San Juan. A large demand for coal had to be anticipated, besides provisions, water, and other supplies. The local laboring class were being encouraged in idleness by the distribution of free food by some mistaken charity. Prize vessels were being sent in daily. Blockading vessels were in and out continually. There was a night patrol offshore to keep up. Drafts of enlisted men, small and large, were arriving every few days. Some Spanish prisoners had to be looked out for. Convoy for minor expeditions was several times ordered, to land supplies and men for Cuban forces. All the time a steady stream of information flowed in and out. The press correspondents were everywhere about, eager and insistent. And in addition, there were local disturbances in Key West beyond coping with by the police. Some indication of the

variety of business handled is contained in a memorandum of the principal heads under which the office records were filed. (See Appendix C.)

Had the necessity for a base commander been recognized and provided for even but one week earlier, all things could have been much better ordered. This extreme of pressure at the outset had one great advantage, however, in forcing the way to short cuts. The general result was that, throughout the existence of the base administration, all its business was transacted with a minimum of paper work. Probably nowhere else in the navy was there in actual practice a simpler system of direct and equal association of responsibility and authority. There were very few base orders issued. On July 4, a reissue of all existing orders, together with certain information, was published, which shows how well the effort for simplicity was observed. This, too, has a bearing on the number of staff officers, as well as on the organization of a base in general. (See Appendix A.)

The Key West base organization, if it may be so called, consisted of the commodore and two staff officers; the commandant of the naval station; a lieutenant and a boatswain at the station; one pay officer, with one pay clerk; no doctor, I think—certainly not more than one; and three tugs, under boatswains.

The pay officer, Paymaster Joseph Foster, besides being yard paymaster and general storekeeper, had also been charged with the accounts of all vessels carrying no paymaster. More of these craft, already numerous, were arriving daily, and all were clamorous for ration money, provisions, clothing and small stores, and money, besides coal, water, and supplies. Almost my first recollection is of the pay officer coming to the commodore, in great agitation and distress, to protest that he could not discharge any duty among so many. He was a man well on towards 60 years, and should never have been sent to frontier work in the first place. The department had promised help *soon,* but was noncommittal as to date and evidently did not appreciate the situation. Meanwhile conditions grew rapidly worse. Once a day the pay officer came to protest. The fourth time, he was pallid white and could hardly speak. The commodore gave some encouragement, and he turned to go. One step on the stairs, and he fell the rest of the way. That, and that alone, seemed to arouse the department.

Although enough had already been telegraphed and written to inform the department fully, the commandant said he would telegraph again. I asked to write the message, and produced one that made a sensation in the department, as Paymaster General Kenny afterwards told me. It started four paymasters to Key West inside of 12 hours, and within three weeks there were 14 pay officers performing duties that had at first been shoveled upon one. Meantime all system had gone to pot. Officers and petty officers took whatever they could lay their hands upon, and the most that could be attempted towards accounting was to obtain memorandum receipts.

In the course of a fortnight, the supply of material became as well systematized as possible in the circumstances. The commandant of the station attended to all the details, and applications for all kinds of supplies were made to him or his subordinates. Whenever any one in good old navy fashion brought his tale of needs to the senior officer present, he was steered away to the commandant. The commandant's indoor force had been brought up to needs; and outdoors he had an assistant, Lieut. Webster Doty, retired, who in ability, energy, force, and tirelessness was exactly fitted to the place. (Appendix A, pars. 4, 24, 25.)

What the base commander did require to know of each vessel's material condition concerned only her military qualities and readiness. Each captain, upon reporting his arrival, would fill out a small blank form which was handed to him; and then, in the ordinary course, he was done with the base commander, and the base commander was done with him, until the time came for his sailing orders. (See Appendix B.)

It is possible that the absence of departmental instructions defining the commodore's authority worked to advantage, in causing him to exert an authority wider and more absolute than perhaps the department would have given in advance. In the absence of any senior in rank, he actually exercised the powers of a commander-in-chief, except as to general courts martial. No case arose requiring a general court; but there can be no doubt that the base commander should have had full disciplinary powers. This power can be conferred under existing law by designating him "commander-in-chief of base squadron."

In regard to local order on shore in Key West—soon after the commodore's arrival a prominent citizen, accompanied by the

United States marshal, applied to the commodore for a regular night patrol of the town. The mayor was understood to be of the same mind, but unwilling, for reasons unstated, to join in the request. The Key West police, two or three in number, were unable to deal with the rough gangs, colored and white, that infested the water front saloons. Some of these unruly ones had murderously attacked enlisted men, and retaliation had been promised for that night. A patrol was accordingly ordered, and was kept up as long as the *Panther's* marine battalion remained at Key West. Later, a small guard was regularly attached to the station. In the interim, some kind of a patrol was maintained whenever men were available from ships in harbor. For a week or two, however, there was no patrol. Under these circumstances, of course, no men available for guard meant none on shore in large numbers to feel concerned about, none to cause trouble; but it also meant that during two weeks there were no guards for the station storehouses, containing $3,000,000 worth of material. Two or three watchmen were the only protection; and it would have been a very simple matter, with a stick of dynamite, to do great damage without detection. There were two companies of army troops in garrison, held in readiness; but these were some distance from the town, and they did not take part for local security. No doubt they would have done so if urged. No request was made, except one night that they stand by; but the commanding officer was made aware of the situation.

Before the arrival of a regular station ship, the handling of drafts of men was an embarrassment. All kinds of shifts had to be made, especially as the station paymaster was over his head in work. After the *Lancaster,* Capt. Thomas Perry, arrived, the difficulty disappeared. She had two regular line officers beside the captain, and all details could be safely left to the ship. (See Appendix A, pars. 13-17, 19, 20.)

The *Lancaster* had been promised to Commodore Remey by May 25, supplied with all necessary equipment for a flagship. She had only recently returned from a flagship cruise in the South Atlantic. She arrived at Key West on May 31, and we moved on board next day; but, though fresh from Boston, she was almost completely stripped of everything. The wardroom used newspapers for tablecloths and drank water out of champagne glasses. The flag office was a bare, empty room, with not so much as a

table in it. No office supplies of any kind, not even a pencil. And the ship's electric plant had been taken out. Slowly and very grudgingly the necessary stationery and office outfit were sent. Although office work had to go on far into the night, the reinstallation of an electric plant was refused by the Bureau of Equipment, as unnecessary and unsafe, until the commodore wrote in terms that admitted no denial.

For yeomen, vain search had been made, in the *Lancaster's* crew and in a large naval militia draft. One man had been found who could run a copying press and deliver simple messages. At the end of four weeks, I was still doing all the other work of the office. Upon the *Lancaster's* disappointing arrival I telegraphed my uncle, a clergyman in Boston, to find a clerk for yeoman, have him enlisted on board the *Wabash* and sent down to me, which was done. Then, barring the absence of lighting suitable for protracted night work, and no night signaling apparatus for the base station ship, the ***minimum*** equipment for a base commander ***in home waters*** may be said to have been complete at Key West by ***seven weeks after war began.***

Key West was the main center of communication until about the middle of June for the battle fleet, and all the time for the blockading force. Excepting messages via San Nicolas Mole and the like, all information and orders, by wire or mail, from Washington had to be forwarded by vessel from Key West. All reports from incoming vessels came to the base commander's office. The control of the telegraph and cable communications was, however, independent of the commodore. An army signal corps officer (Captain, now General James Allen) was in charge, and his men were continuously on duty in the instrument room. The censorship was in his hands, and by all accounts he made judicious use of this power. Certainly the military information that came in through his hands was very interesting and often important.

Early on the morning of May 19, just as Admiral Schley was sailing for Cienfuegos to ascertain whether Cervera were there or not, Captain Allen came into the office and intimated that he wished to speak privately. When the room was clear of other visitors, he produced a little slip of yellow paper, reading: "*Teresa, Vizcaya, Oquendo,* two destroyers, anchored in port this morning." One's impression on reading it was as if the names had been put down as the vessels were seen coming in.

The absence of the fourth cruiser, *Colon,* from the dispatch strengthened the belief a few days later in the existence of the reported "phantom fleet," which caused a week's delay of the Shafter expedition.

After some consultation, Captain Allen left the office to forward the news in cipher to the War Department. The commodore sent the information to Admiral Sampson by his flag lieutenant, Lieutenant Staunton (now rear admiral), who happened to be in the adjoining office at the time. In the presence of Admiral Sampson's flag, Commodore Remey was no longer the senior officer present, his orders explicitly placing him under the commander-in-chief afloat; and so, having communicated Cervera's arrival to his chief, the commodore did not further concern himself with it—having plenty else to do. This was about 9.15 a. m., and Captain Allen's cipher must have reached the War Department by 10.30 at the latest. Later in the afternoon (as Admiral Remey ascertained some years afterwards, in a personal investigation of this incident), the Western Union's Washington manager, strolling into the Navy Department, casually inquired as to the Cervera news, of which he was already aware. The reply was that no such news had been received by the Navy Department up to that hour, 5 p. m.

On the whole, the control of what went over the wires was satisfactory, in the circumstances of the general situation; and as the army signal officer took pains to keep in touch with the commodore, there was good cooperation. But surely, such important service as information, communication, and censorship, at a place primarily a naval base, ought to be under the base commander. It is the foundation of all that concerns his duties beyond his immediate range of vision; while to local security information is essential.

The local night patrol offshore, intended to guard against surprise of Key West harbor, was maintained for some days, by a single vessel. There was no force in readiness, nor able, usually, to back it up, nor was there any plan to oppose a raid. Fortunately, this implicit confidence in the security of Key West was rewarded by inaction of the enemy. There was no control of the anchorage, no harbor regulation, day or night. Vessels not belonging to or serving the navy came and went at will, at any hour of the twenty-four. The only restriction on movement was

on the part of a wharf owner, who once ordered a naval supply ship to leave his wharf immediately, threatening to cut her lines if she delayed. When he produced an axe, the master of the offending vessel casually displayed a revolver, so no overt step was taken; but the incident was characteristic of local conditions and of obstacles that should not have existed for a moment.

This absence of harbor control caused difficulty in controlling the press correspondents. In connection with some movement, I think of the first troop convoy, Washington ordered, some days in advance, not to let any press tugs leave Key West after a certain time. Preparations were made accordingly. No suspicion was aroused, and a guard was ready to hold all press vessels about 12 hours ahead of time. But they must have got wind of it from Washington, for in spite of our secrecy, when the time came there were none to hold. To allow the unrestrained movement of vessels in the vicinity of a naval base in time of war seems inconceivable, yet we did it.

Not merely had the base commander no definite control over any but naval vessels; but naval movements were hampered by local civil authorities. State quarantine was enforced, and all vessels incoming were required to await, and fee, the state quarantine officer. Ordinarily he was prompt. Occasionally a delay of two or three hours occurred. The base commander did not allow this rule to apply to captains of naval vessels from the blockade, or which had not made a port since leaving Key West. They came to report at once, so that news might not be delayed.

One intolerable instance arose over pilotage. The Florida laws make pilotage compulsory. A large coal schooner was ordered from Key West to Guantanamo in tow of the *Lebanon*. The day before sailing, the collier's master reported that his vessel had been libeled in the United States Court for outward pilotage, and that a deputy marshal was on board to prevent her sailing without paying. The situation was at once fully explained to the clerk of the court and to the marshal—vessel under government charter and to be towed by a commissioned naval vessel. But they would not dismiss the libel, said they could not; only the judge could, who was in Jacksonville. The commodore telegraphed the judge, who never replied. Also he informed the Navy Department of the interference. Secretary Long replied in indignant terms, concluding, "Send the vessel to sea." Next day, just before the sail-

ing hour, fixed when the vessels would be pointed fair by the tide, the flag lieutenant boarded the collier and offered the deputy marshal passage ashore, which he accepted, rather than be carried to Guantanamo. Technically, the commodore had made himself liable for the libel and for contempt of court, but of course that ended the incident. But this, and other local irregularities, and the probability of having to enforce strict sanitary measures in the event of yellow fever breaking out, caused the base commander, with the concurrence of the army officer in local command and the army senior medical officer, to urge in the strongest terms that Key West be placed under martial law. This was one of the few subjects treated by letter. Secretary Long replied by telegraph that he and the Secretary of War strongly approved and urged favorable action, but the Administration would not authorize martial law, stating that they (in Washington) did not consider it necessary, and that it might be construed as a reflection on Key West and the authorities of Florida.

Before the base office was established, a considerable portion of the best anchorage area for vessels obtaining supplies had been sown with electrically controlled mines. Vessels could traverse this mine field freely, and they sometimes anchored on its edge, or even in it. One evening the monitor *Puritan*, Capt. Frederick Rodgers, about half-past 6 o'clock, weighed for sea, and picked up a mine with her anchor. She let go the other anchor while clearing the first; then hove up the second anchor—and a second mine. And still a third mine was brought up in the same way. About this time Shipley arrived on board to inquire as to the trouble, finding the captain quite unable to express his feelings. Then, as it had grown dark, he decided to await daylight to get clear of the mine field.

No naval hospital had been established at Key West. The army had one, where naval patients were cared for. This arrangement worked well enough until the army wounded began to flow in. Anticipating this, the base commander had urged the establishment of a naval hospital, for which a suitable place was available. The surgeon general did not approve. Consequently, one day, on short notice, to make room for army wounded, twenty-odd naval patients were turned out, with no place to put them but the *Lancaster*, already well filled as a receiving ship. One incident in this connection is not easily forgotten. Engrossed in work

though we were, it was impossible to shut out of our ears the ravings and finally the harsh rattle of one poor fellow who lay dying of pneumonia, on the half-deck, just across from the office. It was no place for him, but the navy had no better at the time.

The fear of yellow fever brought about a complication that was very annoying to the officers of the fleet, and might have been serious. In the absence of suitable supply vessels to ply between the base and the fleet, use had to be made of any and every vessel going from Key West to Guantanamo, to carry mail, express, government stores, mess supplies, and clothes from the various Key West laundries. Very many express packages and all of the wash clothes were delivered to these carriers only upon payment of charges. The commander-in-chief had ordered the base commander to have all these prepaid, against future reimbursement. The local paymaster protested, but complied. A large accumulation had been placed on board the *Yankee,* Commander Brownson, and she was about to sail, when one of her crew developed symptoms of yellow fever. The doctors disagreed in diagnosis; but there was enough suspicion to keep the patient on board the *Yankee.* Had there been a naval hospital, the base commander could have ordered the patient transferred there at once and sent the ship on her duty. As it turned out, the man died, the report of yellow fever was sent to Washington, and the *Yankee* was ordered by the department to go to New York at once, with strict injunction not to discharge nor transfer anything that had been taken on board at Key West. (This took place before the discovery of the mosquito as the yellow fever carrier.) For weeks afterward, until the base was disbanded, complaints kept coming in about packages shipped by the *Yankee;* and three years later the commodore was checked over $400, for private charges paid at Key West, and never reimbursed. Explanation of the facts was made to the department (not for the first time), which then took up the matter and settled it in the appropriation bill.

At the same time with Commodore Remey had come Commodore Watson, his junior in rank, to command the blockade. Before the latter proceeded to the blockade, and when he returned to Key West, the presence of two seniors afloat at first caused confusion. In the absence of any semblance of tactical or admin-

istrative organization, all captains would apply for everything to the nearest senior; and as Commodore Remey's office was on shore, many found it only natural, as well as more convenient, to apply to the commodore who was always afloat. No instructions defining spheres of authority having been promulgated by the department, and no permanent designation for particular duties having been made of the many ships basing on Key West, it was inevitable that conflicting instructions should be given; and in the first few days several instances did arise. One concerned the *Merrimac,* then in a leaky condition with pumps not working. Her captain, Commander J. M. Miller, strode into Remey's office early one morning, rather disturbed, saying: "Commodore, what am I to do? You tell me to stay in Key West and Commodore Watson orders me out. I am between the devil and the deep sea!" "Which am I?" said the commodore, with a quiet smile. And then, after disposing of that case, he took upon himself to issue definite instructions, so that thereafter no movement order to any naval vessel in Key West was issued by any other than himself, except by another commodore or flag officer to his own flagship. These instructions did not apply to squadrons, as the base had no concern with their movements.

It was on account of this difficulty and because of his paramount responsibility concerning things afloat, that Commodore Remey never accepted the designation by which the department first addressed him, of "Commandant," which our regulations specified as indicating a shore command. He signed and referred to himself officially as the "Commodore Commanding Naval Base, Key West." Such a limitation in meaning of the word commandant seems to be peculiar to our service; but because our custom *is* so fixed, and because the functions of the senior officer at a base must concern things afloat as well as facilities on shore, it has always seemed to me that Commodore Remey's position was well taken. From that I would deduce that we should always use the term "Base *Commander,*" instead of "Commandant." It may seem a small point, but it has caused confusion once and might do so again.

Not only duties local to the base, but also expeditions came under the base commander's cognizance. To meet the demands for vessels in various directions, he had often to divert some from the blockade. No orders for these side expeditions came from

Admiral Sampson; all were from the department. It may be said of them generally that it was wasted effort. It was filibustering, the time for which had passed. These diversions continued even after the arrival of Commodore Howell, to command the blockade. He was senior in rank to Commodore Remey. It would then happen occasionally that the base commander would have to take vessels of a senior's command temporarily absent from his presence and divert them to other duties from which the senior would never get them back. This particular senior appreciated the situation, and never while in Key West attempted interference in the base affairs; but another might have done otherwise, in the absence of definition of spheres of authority; and certainly the arrangement was loose and haphazard in the extreme, fatal to any large scheme of operations.

One such expedition had some influence on the fame of one officer. "Don't you think," the commodore wrote, in comment on the original manuscript, "it would add interest to it to relate how near the *Gloucester,* Lieut. Commander Wainwright commanding, missed being in the battle of Santiago, where he so highly distinguished himself? As I remember, I was about to order the *Gloucester* to the blockade of Havana, where vessels were very much needed, when I received an order from the department, marked important, to land a Lieut. Colonel Hernandez and another Cuban officer, who would soon report to me, at a designated place near the eastern end of Cuba, to communicate with General Gomez, the Cuban commander-in-chief. I ordered Lieut. Commander Wainwright, commanding the *Gloucester,* to perform this duty, and after its completion to report to Rear Admiral Sampson, the commander-in-chief. I did this on account of their then being in the near vicinity of each other, but the vessel was needed off Havana."

A special mission for the rescue of two newspaper men was asked for by one Mr. Scovell, who was afterwards made conspicuous at Santiago by the forbearance with which General Shafter treated him after a personal assault. The commodore, not thinking very much about correspondents in those days, gave him little encouragement, but Scovell persisted until he was given an appointment to discuss the matter. The two men in trouble had been arrested near Havana as spies. Concerning one, a photographer, Scovell professed to care little; but he was very anxious

lest the other man, for whose safety he felt responsible, should be "garrotted on short notice." The commodore replied that he cared no more for the correspondent than for the photographer. Action must apply to both, if any were taken. Scovell's representations were so urgent that a dispatch to Washington was drawn up, resulting in the exchange of several telegrams, and finally the despatch of the tug *Uncas,* Lieutenant Brainard, to Havana. The Spanish authorities agreed to exchange the men for a Spanish colonel and one other officer, who were taken over by the tug.

As soon as the *Uncas's* mission became known—for of course it was impossible to keep it dark—a number of correspondents importuned to go in her, which was refused, on general grounds as well as because the agreement with Havana expressly forbade it. Among the eager ones was an Englishman named Knight, of, I think, the London *Daily Mail.* We had a suspicion afterwards that one or more did stow away on board the *Uncas.* It would have been easy to do so, amid the generally prevailing confusion, as the tug left Key West in the darkness of early morning. No proofs came to light, however, and although Knight did reach Havana soon after, it was not by one of our vessels. Three years later, on some occasion during the then Duke of York's visit in Australia, a one-armed man recalled himself to Admiral Remey as the same Knight. He had lost an arm in South Africa. He hoped the admiral harbored no ill-feeling—as of course he did not—for his escaping our vigilance.

The case reminds one of Mr. Bock's. The Navy Department had directed that the French steamer *Lafayette,* from Vera Cruz, should she call at Key West, be given a pass through the blockade into Havana, it having been agreed that she would land only the mails. Mr. Bock had evidently heard of this, and he applied for permission to go on her. He seemed over-anxious to get to Havana. The commodore declined permission, upon which Mr. Bock produced a letter from Admiral Sampson—something like a letter of introduction—and asked if that would make any difference. The commodore replied no; that he could obtain permission only through Washington. We thought no more of the matter, until two hours later a telegram came from Secretary Long, approving the commodore's action in not granting permission. We were at first somewhat mystified at his telegraphing at

all on a matter about which we had informed him nothing, but later concluded that the urgings in Washington were strong enough to make the Secretary fear lest Mr. Bock finally prevail over the commodore. It was our impression that Mr. Bock had strong sympathy with the Spanish side, natural enough for one so long resident in Havana. And after all, the *Lafayette* never came to Key West.

A great deal might be written about the prizes brought in, but a single case may suffice. The British steamer *Restormel,* loaded with coal for Cervera, was sent in by the *St. Paul,* Captain Sigsbee. The prize arrived in a leaky condition, and it was feared she might sink and obstruct the fairway or anchorage, none too large at best. Accordingly, after the judge of the prize court had been consulted and given assent, the cargo was taken over by the naval station for naval use, the price to be fixed later. There were about 3000 tons of picked Welsh coal, the sum involved being about $14,000. This seemed to us a good haul, as well as a good precaution; but in the press of affairs, the matter escaped being reported to the Bureau of Equipment early. They learned of it only after several weeks, in the course of routine reports from the naval station. Then they inquired for particulars, and when the commodore wrote them, his action was approved, but in terms that were intended to make it clear that the Bureau of Equipment was buying all the coal for the navy.

The mail service to the fleet became an embarrassment, especially after the troops reached Santiago. The postal authorities were swamped and applied for assistance. Finally the *Fern* was designated as a mail steamer, the only vessel available of practically no military value. The accumulation of mail for a large force assumes such proportions in a few days as to exceed the available safe stowage space of the average vessel. Official mail may be considerably reduced in time of war, where so much is done by wire and radio or omitted altogether. All that which is important enough to send ought to be registered or else enclosed in an odd colored bag, easily distinguishable. If sent in the ordinary first class bags, it is liable to be snowed under or delayed by an accumulation somewhere en route.

In addition to the distribution of personnel, the base commander had to order examining boards in several cases for the admission of officers to commissioned grades. This seemed to us

at the time like an imposition on a busy office, besides taking the time of officers of active ships. Nevertheless, considerable pains were taken to make the examinations thorough. Later, when some of the volunteer officers described the nominal examinations they had had, our work still more appeared supererogatory. One junior lieutenant from a Middle Western state said that he applied to be an ensign and was offered a commission as junior lieutenant. He declined, on the ground of wishing for some experience. He had never seen blue salt water. But the junior lieutenant commission was given him just the same. In one ship, commissions to the volunteer officers seemed to have been given in inverse proportion to their experience. A senior lieutenant had had no sea experience; a junior lieutenant had been two years at Annapolis; and of two ensigns, one had formerly been an ensign and the other had been a master of vessels for several years. Truly, rank here was no assurance of experienced ability.

OUTLINE OF A PROPOSED BASE ORGANIZATION

What has gone before dealt mainly with the wasteful, demoralizing, or obstructive effects and untoward incidents resulting from lack of preparation. What follows aims to bring out some principles that should apply in the preparation and organization of a naval base.

Experience at Key West in 1898 indicates that the base commander should have supreme powers over all in the vicinity, both on land and sea, subject to orders only from the department and the commander-in-chief. Perfect cooperation of these two must of course be assumed. Existing regulations already forbid diverting forces of the commander-in-chief's other subordinate commanders that may visit the base. Naturally a base commander would not detain, divert, nor interfere with the forces of active commands without imperative reasons, since the function of the base is to aid and supply such forces, not hinder their operations. But he should have the *power, ex officio,* to detain and divert such forces in emergency, so that he may coordinate all effort in resisting attack, and so that conversely there may be no interference in base affairs by any senior except the commander-in-chief. Compare the authority of the German station chiefs of the great naval home bases, Kiel and Wilhelmshaven:

Over the regular independent commands afloat the station chiefs have ordinarily no authority, but for the defence of the military ports they, as governors of fortresses, have absolute control over everything ashore and afloat, within the lines of defence; and they may also, in other cases of emergency, assume command over all forces afloat.

The location of the base commander's office is a detail of some importance. The office on shore in Key West was as convenient to the water front as could be desired, but the *Lancaster*, moored in mid-harbor, proved much better. The only drawback there was the delay in receipt and dispatch of telegrams. This was minimized by having a steamer always in waiting at the dock, night and day. A better arrangement, which should be provided for, would be to have telegraph and telephone cables brought on board the base commander's flagship, for direct communication with all parts of the base, and with the world's cable and radio system. Circumstances must govern the base flagship's location. Alongside a wharf or quay might be more suitable than moorings near mid-harbor. In such case, a building on the sea wall might serve for offices and quarters instead of a ship. The desiderata are direct accessibility to ships' boats and direct signal communication with vessels in harbor.

Whether the base office be afloat or on the water front, the base commander and all his staff should live on board or close at hand. Office hours must be all the twenty-four, and the staff be in numbers sufficient for reliefs in some duties. Some staff duties, however, cannot be done in alternation. One mind must be in continuous charge. Hence there should be no time wasted in going between office and living quarters. The staff must live on the job. The staff and base commander should all mess together, also; or at least the staff should mess apart from officers not of the staff, in order to lessen the risk of leaks through careless speech.

The foregoing regards the base commander's location from the view-point of active forces visiting the base. Looking inwardly, the constituent parts of the base organization require close knitting together, for efficient cooperation, and above all, for saving time. In Key West, the base commander, after the first rush, divested himself almost entirely of control over material supply. He could do so there without hesitation, because supplies were almost unlimited in amount, and all comers were on the same

footing. Yet even in Key West the commodore felt it necessary to keep a hand on the water supply, which the navy obtained largely from the army. The tank vessel *Maverick*, with 1,000,000 gallons of water for army transport use, had arrived while we were still struggling to obtain a supply from nearby sources and from our half-completed evaporating plant at the naval station. The commodore telegraphed to Washington for its transfer to us. The Bureau of Equipment refused to take over the steamer or to charter other tankers; but granted the *water*, and we afterwards obtained a second cargo in the same way. The quartermaster in local charge, Major Sawyer, facilitated things; and altogether we used four-fifths of the army's water supply. It was a godsend, as the bureau would not be convinced that their arrangements for water were inadequate. This, together with Key West's limited repair facilities, explains why the very simple report required of an arriving vessel by the base commander was not even briefer. (Appendix A.)

In an advanced base, or any extra-continental base whereto communications might be distant or be partly exposed, the base commander would keep a comparatively close hand on resources, so as to insure their being disposed to the best advantage for the plans of the commander-in-chief. An important branch of the base commander's staff work would therefore be the material control. For every incoming naval force, the decision would have to be made as to how its wants should be filled; *i. e.*, whether in whole or only in a specified proportion; whether immediately or in its turn; etc. Decisions of this character are military. They do not put the administrative details upon the base commander, but they facilitate the handling of such details by subordinates. With the possibilities of stating wants in advance by radio, and assuming reasonable intercommunication within the base, no delay, no "referring," should be necessary. Moments may be precious; and crews ought not to suffer any unnecessary effort, nor tedious, wasteful standing by, which good administration can spare them. To attain expeditious, harmonious interworking there must be close accord between the base commander's *material control staff officer* and the actual *issuing officers*. The former must know what is the state of the current stock, and the latter must have advance instructions for serving out. The accumulation of moments saved by anticipatory methods of administration

often amounts to a considerable gain in time for even a single ship.

To meet the requirements fully, there should be one central office for incomers' reports, authorization of supplies, and sailing orders. This marks out the scope of the functions of one important branch of the base commander's staff work. For active vessels, this is the only branch which normally concerns them. The base commander, on the other hand, will have military as well as material interest in the visiting vessels and squadrons. Consequently, the base commander, his chief of staff, and his material control staff officer must be in the closest association and proximity of location. The same applies to repair facilities.

Between the functions of the control of material and the *issuing* of material there should be no intermediary. The material control officer, having decided whether, in what proportion, and at what time a certain vessel or other unit shall receive supplies, decides further as to what supply vessels in the base shall furnish them; whether the supply vessel shall go alongside of the other, or *vice versa;* or whether, if boats are to be used, the base facilities or the ship's own boats shall do the transporting. Arranging for these details with timeliness is possible only through close coordination and close *proximity of offices,* of the base staff, including chief of staff, material controller and harbor master. With good organization and intercommunication, incoming vessels would normally receive, before or upon entering, their directions where to anchor, or alongside what collier or supply vessel to moor, so as to eliminate delays and unnecessary movements inside the harbor.

The "reasonable intercommunication" which has been twice alluded to is a requirement of importance easily underestimated. During the several weeks before the declaration of war, when vessels at Key West were clearing for action, some of them left many of their boats at the naval station. Distances were not great at Key West, especially for the vessels which visited there repeatedly. Most were small enough to lie within easy reach of the wharves. Yet one after another they found it necessary to take their boats back again. The same short distances made getting about on naval base business comparatively easy, but still it was occasionally embarrassing not to have more means of transportation. Compared to a war time of real pressure, conditions at Key

West were leisurely. At an advanced base near the active theater, expeditious dispatch will be indispensable. The means to insure it are simple, direct organization; attentive, anticipatory administration; and an outside management and follow-up system that will prepare the way, keep things moving, and enforce the full execution of orders. There must be good signal, radio, and wire service for verbal communication; but the minor water transport will none the less be a factor of large importance. The question of boats for the fighting ships is a matter for careful consideration. The quota of boats for the base must include ample provision for ships reaching the base without any boats of their own or with none serviceable. The subject is too detailed for further treatment here, beyond noting the importance of a liberal provision of tugs, motor-boats—some for speed, some for carrying—and weight carriers, such as our large sailing launches. In order to carry out the arrangements of the material control, there must be good communication with the issuing officers, who would be the captains and masters of the various supply vessels. Signals alone will not suffice. The base staff and messengers on the base commander's business must always be able to get about on the water quickly and without waiting.

In connection with supply comes the maintenance of communications, the replenishment of the base stock and the return of empties. To what extent the supply-conveying force shall be under the base commander will vary with circumstances. It is a military function, to be handled by the staff with others of like nature. For lookout and picket duty, and for convoying supply ships in and out, clear of local exposure, an advanced base will need a number of armed vessels, depending upon the enemy's possible reach. The management of these vessels, which may be classed as Mobile Defence, will form a distinct naval branch of staff work.

The fortifications, mine fields, torpedo floats, and their infantry supports form another distinct sphere, which may be denoted by the inclusive term Fixed Defence. This is a sphere for the marines and army troops. With the marine corps' present limits of 10,000 men, or even allowing for its expansion in the advocated ratio of 20 per cent of the navy, there would not be available enough marines alone to garrison a single base so salient as Guam. In the absence of a marine corps reserve, there would

have to be army troops to complete the number required. That would immediately raise the question of command. The base commander must be placed in supreme command of all by special order of the President, empowering him to command army troops at the base. Between army and marine corps combined in service there is no question; the senior commands. An objection here to an army officer being in command on shore would be that marine officers are trained in advance base work and are familiar with navy administration.

The base commander should be a rear admiral. Otherwise he would not outrank the troop commander on shore, who would have the strength of a division under him. In any selection, fitness of the individual, rather than rank, should be the criterion, within reasonable limits; and until our flag officers' list is much expanded, probably the choice for base commander would fall upon a captain. In that case, he should be immediately commissioned a rear admiral, under the authority of statute already existing for a state of war.

Security and police on shore naturally fall under the military commander. Security and police afloat inside the defences, together with control of anchorages, belong to the harbor master or port captain. Security afloat inside will depend largely on the guard and patrol outside. Hence there must be close connection between the port captain and the Mobile Defence branch, and since the harbor craft may often be drawn upon to augment the outside patrol, and the outer patrol vessels would come under the port captian upon entering inside, the logical arrangement would seem to be to place Mobile Defence and harbor control together under the port captain.

The Information or Intelligence Service forms a distinct staff branch which touches all other branches. It should embrace all cable, wire, radio and signal service, secret service and censorship. The official head is the chief of staff; but under him there should be an expert in secret service work as the real head of that part. One cannot read of past wars without amazement at the magnitude of the part played by secret agents. With the greater frequency and facility of communication of our day, and the characteristic indiscretion of our press in military affairs, the Intelligence Service must be strong, firm and active. It must be alert, especially against enemy secret agents.

Finally, there must be provision for the dispatch of disciplinary matters. There is little time near the area of active operations for many officers to drop other work in order to sit on courts martial; or in the staff office, to draw up technically correct court papers. There is likelihood of considerable business in war time with offenders or suspects; and the more thoroughly the machinery can be prepared in advance, the less difficulty and fewer miscarriages of justice and of military operations will there be. The base commander needs at least one officer experienced as a judge advocate; and he should have available an officer of captain or commander rank, as a permanent president of G. M. C. These officers need not be on the active list. With such a nucleus, and the officers of the base and marine corps to draw upon, there would seldom be a time when a court of five could not be easily assembled, if not actually in continuous session.

The experience of Key West bears here also. There happened to be one officer of experience (thirty-two years) nominally assigned to duty afloat, but whose command afloat did not practicably exist. He thus became available for other duty, and many kinds of assignments were given him. He was like a spare right hand to the commodore, always ready and capable to give his undivided attention personally and immediately to whatever new requirement the day turned up, and the commodore could act upon his reports with confidence. It is to meet needs of this kind—courts, boards, personal investigations, and missions requiring rank and experience beyond the average lieutenant's—that in assigning the staff of a base commander, "additional aids" should be allowed him. One there certainly should be of rank not lower than lieutenant commander, and preferably two, or more, according to the saliency and extent of the base. Such an unclassified position may strike some as superfluous, but the billet is far from being a sinecure. It calls for energy, adaptability, judgment, decision, and tact, all to a high degree.

Recapitulating, the base commander's work divides into branches and subdivisions, with officers to manage them, as follows:

BASE COMMANDER

Rear admiral, with responsibility and powers of a war-time commander-in-chief, afloat and ashore.

BASE COMMANDER'S STAFF

Chief of staff, a captain or commander.
General direction and supervision.
A. Reports and orders, a lieutenant.
Incoming and outgoing orders, instructions, and reports.
B. Material control, a pay officer.
Fuel, lubricants, and water.
Ammunition, ordnance, and munitions.
Provisions and clothing.
General supplies and equipage.
C. Repair control, a lieutenant commander or lieutenant, a naval constructor.
D. Port captain, a commander or lieutenant commander.
Mobile defence.
Harbor control—harbor master—a lieutenant commander.
E. Intelligence and communication, a lieutenant, a marine officer, an army officer.
F. Disciplinary affairs, a commander or lieutenant commander (may be retired).
G. Sanitation, a medical inspector.
H. Important miscellany, a lieutenant commander.

The foregoing lettered subdivisions should form a so-called "Central Office." In reality, the central office would be the chief of staff's office. The officers in charge of subdivisions would be in immediate accessibility, all on board the base commander's flagship, or in his water front office. Only one officer, the harbor master, under subdivision D, would be an outside or field worker.

The remainder of the base organization would be apart from the staff, as follows:

PERSONNEL CONTROL

Base flagship's captain in charge.
Receiving ship.
Hospital and hospital ships' sick rolls, of officers and men likely to return to duty.

FIXED DEFENCE

A general or brigadier in command.
Fortifications.
Support.
Shore-controlled mine and torpedo defence.
Local security and police on shore.

Thus, to be the principal officers of the base commander's staff there would be required:

1 Captain,
2 Commanders (1 retired),
5 Lieutenant commanders and lieutenants,
1 Medical inspector or surgeon,
1 Pay inspector or paymaster,
1 Marine officer,
1 Army officer,

12 Total.

This seems a large staff until one considers the volume of their business and the importance of handling it with accuracy and dispatch and security. These are the heads of departments. They would need assistants, some of whom would be supplied by the vessels of the train and at the base. There would also have to be several lieutenants for current executive duty, just as a ship needs watch officers as well as department heads:

Signal and radio watch, at least 3 lieutenants;
Personal aids, 2 lieutenants or junior lieutenants.

OUTLINE OF A PROPOSED TRAIN STAFF ORGANIZATION

In organizing the business of the fleet's permanent train, consisting of colliers, supply ships, ammunition ships, tank ships, repair ships, hospital ships, and refrigerator ships, not to mention mine-depot ships and torpedo and submarine tenders, which might often accompany the train, many points of similarity to the base commander's business appear.

The train commander's status should include supreme authority within his command. He should have a commander-in-chief's disciplinary powers. The admiral of the fleet should be *served* by the train, not burdened with any details of its administration. The train commander should relieve him of all that. All the train personnel should be accustomed to look solely to their own commander, not at all beyond him. The power to act summarily in all cases would be especially important in dealing with the comparatively undisciplined personnel that might, probably would, be found in large proportion in the train.

The train business divides as follows:

TRAIN COMMANDER

Rear admiral, with responsibility and powers of a war-time commander-in-chief.

TRAIN COMMANDER'S STAFF

Chief of staff, a captain or commander.
General direction and supervision.

A. Reports and orders, a lieutenant.
Incoming and outgoing orders, instructions, and reports.

B. Material for issue, a pay inspector.

C. Fleet engineer work, a lieutenant commander or lieutenant.

C_1. Hull repair, a naval constructor.

D. Tactical control, movements, station keeping, formations for steaming, defence, and anchoring—a commander or lieutenant commander.

D_1 Troop affairs, a marine officer.

E. Communication (signals, radio, etc.), and intelligence, a lieutenant.

F. Disciplinary affairs, a commander or lieutenant commander (may be retired).

G. Sanitation, a medical inspector.

H. Miscellaneous inspections, examination, etc., a lieutenant commander.

The foregoing may not be all the officers required for staff work. On the contrary, assistants will be indispensable in every subdivision except two, F and G, Discipline and Sanitation. But the work divides naturally in a way parallel to that of the base commander.

When a permanent base exists, as intended at Pearl Harbor, for instance, the base organization would be complete and established before war broke. At such a base, the stay of the train would be temporary; it would be prepared to move, and although its resources might be drawn upon by the fleet, the local facilities and stocks would feel the principal draft.

Advanced beyond the permanent bases, however, no local organization would be found established. Consequently, a base organization, additional to that for the Fixed Defence, must be carried by the train or be supplied from its personnel. The summaries that have been made of the train commander's business and of the base commander's business show that a transition from the former to the latter status would be a convenient and natural procedure. That is, upon occupying a base, the train commander would become the base commander, he and his staff carrying on, without a break, their business at the base corresponding to their duties en route.

In the event of the detachment of a portion of the train to accompany a detachment of the fleet, the managing would fall under the ordinary procedure for control by the senior officer present. Should practically the whole train leave the base, to accompany the fleet, it could do so with least disturbance of administration, ashore as well as afloat, since the Fixed Defence interior organization is independent of the remainder of the base organization, and would be complete for local defence and control on shore in the absence of the train.

There is finally one detail deserving mention by reason of its importance to continuity of military administration at the base. Considering the physical drain of a tropical climate and other causes that might lead to the disablement of the base commander for duty, his chief of staff should be expressly empowered to succeed him. Assuming that the base commander and his chief of staff are chosen for their qualifications, it would not be conducive to smoothness of working for the temporary command to devolve upon a chance senior. The base chief of staff should therefore be furnished with a provisional commission as acting rear admiral, antedated, for use during the disability of his chief. Such a measure would preserve the authority and prestige of the base commander's office unimpaired and unbroken—not a small consideration in a heterogeneous organization, especially when it is remembered that the majority of persons on duty at the base are inwardly, if not outwardly, chafing or disappointed at not being "at the front."

APPENDIX A

Naval Base
Order No. 2

NAVAL BASE, KEY WEST,
U. S. FLAGSHIP "LANCASTER," July 4, 1898.

1. Vessels in port using steam launches will send to the flagship for mail at 10 a. m. and 4 p. m. daily; other vessels will send once daily, at their convenience.

2. Commanding officers will compare their signal books with those of the flagship upon each return to the naval base.

3. Immediately on arrival in Key West, commanding officers will send a written report to this office of coal, water, repairs, and supplies needed, and the probable duration of stay in port.

4. Hospital tickets and requisitions should be sent to the commandant of the naval station for action. Requisitions should never be sent by mail, but should be personally followed up until the articles required are secured.

The limited facilities at this base demand that every ship's needs be diligently looked after by her own officers.

5. Under no circumstances will ashes be dumped overboard from ships or steam launches in Key West Harbor.

6. The inspector of the 7th Light House District offers facilities in his office, 3d floor of Custom House, to officers of vessels desiring to plot on their charts the position of the new buoys near the main ship channel, Key West.

7. When vessels coal alongside chartered colliers, immediate report will be made to this office of any claim for damages received by the collier. Commanding officers will make sure whether the master of the collier intends to make a claim.

8. Naval vessels will deliver to the nearest postoffice, to be held subject to orders of the postoffice department, any sacks of mail that may be found on board captured vessels, except when some military reason interferes with such a course.

9. The department warns vessels flying flag of truce that, if they approach Spanish coasts nearer than six miles, they will be fired on.

10. The department directs that under no circumstances will the reserved pay of undergraduate cadets be encroached upon. Five dollars of each month's pay must be transferred to the reserved pay.

11. All enlisted men, when liberty is allowed, will be required to return to their respective vessels at ten o'clock or earlier. Stragglers will be sent for next morning by the ship's police.

12. The list of officers and men on board ships when prizes are taken must be made out with great care; the full name of every officer and man and the exact rank or rating held at the time the prize was taken must be stated. The lists must be in duplicate, one for the Navy Department and one for the Auditor for the Navy Department; they must be certified by the commanding officer; and must be submitted with claims for prize-money.

13. Applications for men to fill vacancies in the complement of any ship will be made direct to the commanding officer of the *Lancaster*, in writing. Exchanges also are permitted, with that ship. When the required ratings cannot be supplied, the total number of the complement will be filled by men of other ratings.

14. Commanding officers are directed to keep the total number of their respective complements filled, and will also, until further orders, keep as many men in excess as can be accommodated without detriment to health and efficiency. Most of the men now available as reserve for the fleet being inexperienced, it is desirable that they see as much service as possible in vessels where they may have instruction and drill.

15. Applications for men for a vessel will be made immediately on arrival at the base; if more men are needed later, a second application will be made the day before the commanding officer expects to report his vessel ready for orders to sea. Vessels long in port will avoid asking for men oftener than once a week.

16. Vessels that have not received from the department their war complements will make immediate application for them, recommending such additions to their ordinary complements as they deem most advisable.

17. When men are transferred to hospital, their accounts, papers, and effects will be transferred immediately to the *Lancaster;* and the vacancies in complement so made will be at once filled.

18. The rating of electrician has been established, with the view of taking all gunner's mates out of dynamo rooms, as far as practicable, in order that they may be distributed among new ships. Gunner's mates are not to be given acting appointments as electricians, and should not be detailed for electric plant, if electricians are available. The Bureau of Navigation desires that gunner's mates, where possible, be relieved from duties that can be performed by electricians.

19. Naval vessels visiting Port Tampa are authorized to enlist men for general service, for one year unless sooner discharged, in the ratings of seamen, ordinary seamen, machinists, and firemen, first and second class, and any other ratings necessary for the fleet. Men may be enlisted in the ratings specified without regard to the necessities of the fleet, and will be transferred to the *Lancaster* or vessels needing them.

20. Men of vessels in Key West whose terms of enlistment are about to expire will, if possible, be sent north by public conveyance for discharge. Before a vessel leaves the base for her station, all such men will be transferred to the *Lancaster,* provided an opportunity is soon to occur for transfer north.

21. Vessels to which no medical officer is attached may obtain needed medical service from the *Lancaster.*

22. Commanding officers of vessels whose accounts are kept by the pay officer in charge of accounts of auxiliary vessels will send him immediate information on any occurrence or transaction that affects their respective accounts; and upon each return to the base they will promptly confer with him on all such matters.

23. Newly commissioned vessels must send in a descriptive muster roll before first leaving port; and all vessels must without fail send in the reports of changes of officers and men, before sailing.

24. Vessels will keep their supply of ammunition as near the full allowance as practicable, transferring to the naval station all empty ammunition cases, to be sent north.

25. Any U. S. naval vessel requiring a pilot will apply to the commandant of naval station.

26. Commanding officers will aid in every way possible in preventing the introduction of yellow fever into the United States, through the medium of small craft containing persons and baggage, landing surreptitiously on the Florida coast. Such vessels should be apprehended, if the circumstances of the service permit, and sent in to the nearest of the following quarantine stations: Mississippi River, Ship Island, Mississippi, Mobile Bay, Mullet Key (Tampa), Dry Tortugas, Brunswick, Sapelo, and Savannah, Georgia, Charleston, Cape Fear, Cape Charles.

27. No baggage, clothing, merchandise, or other material, not of a strictly military or naval character, that is capable of conveying infection, will be received on board U. S. vessels; and any vessel arriving in Key West with any Cuban or Spaniard aboard, of whatever rank or character, will hold herself in quarantine until regularly granted pratique.

28. The freight or express charges on mess stores or other goods ordered from the north should be prepaid, as the forwarding of such matter is greatly facilitated thereby.

GEO. C. REMEY,
Commodore, Commanding.

APPENDIX B

Report required by Par. 3, Naval Base Order No. 2.

U. S. S. ....., Key West, ..., '98.

From ..... Probably stay .... days. Can go (how soon). Coal on hand, ... days ordinary steaming. Require ..... tons.

Water required, for boilers, ... gals.; for drinking, ... gals.

Supplies needed: .....

Repairs: Boilers, ...

.....

Engines, ...

.....

.....

Commanding.

APPENDIX C

1. Condition.
   Hospital.
   Deaths.

2. Naval base and station.
   Repairs.
   New equipment.

3. Commander-in-chief.
   Squadrons.
   Blockade.

4. Mail.
   Freight and transportation.
   Telegrams confirmed.

5. Officers—1.
   Officers—2.
   Officers—personal.

6. Ammunition.
   Coal.
   Water.
   Various supplies.

7. Vessels A-N.

8. Vessels O-Z.
   Revenue cutters.

9. Boards.
   Courts.
   Damage.
   Sentences.

10. Men.
    Men-named.
    Men-reports.

11. Miscellaneous.
    Miscellaneous personal.
    Convoy and expeditions.

12. Prize vessels—1.
    Prize vessels—2.
    Prisoners.

Naval Base
Order No. 4

NAVAL BASE, KEY WEST,
U. S. FLAGSHIP "LANCASTER,"
August 15, 1898.

30. All enlistments except of continuous service men, will be discontinued. Paragraph 19, Naval Order No. 2, is therefore revoked.

31. Hereafter, men in excess of a vessel's complement will not be retained longer than is necessary to transfer them to the *Lancaster*, or a vessel whose crew is short of the allowed complement, nor will any men be furnished in excess of complement.

32. Men whose terms of enlistment have expired will be immediately discharged in Key West. When a man is discharged in Key West at his own request, the fact of such request will be noted upon the enlistment record and the discharge.

33. Commanding officers will be particular to send with men's transfer papers a letter, stating specifically the authority and reason for transfer and calling attention to any unusual attendant circumstance.

34. The temporary entry in the navy secret code to be made in May last, in Table B1, 08145, and 08146 respectively "Flying Squadron" and "Commander-in-Chief of Flying Squadron" will now be removed.

GEO. C. REMEY,
Commodore, Commanding.

Naval Base
Order No. 5

NAVAL BASE, KEY WEST,
U. S. FLAGSHIP "LANCASTER,"
August 16, 1898.

35. Hereafter vessels will carry the usual running lights.

36. Vessels arriving at Norfolk are to proceed to the quarantine station and to comply with the quarantine regulations; and vessels going to other northern ports will be careful not to transgress the local quarantine restrictions.

GEO. C. REMEY,
Commodore, Commanding.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

HANDLING MEN

By LIEUTENANT R. A. THEOBALD, U. S. Navy

AS A DIVISION OFFICER

In the training of a naval officer, very little advice or instruction is given in the most important requisite of efficiency, namely, the handling and controlling of men. Unfortunately, this can never be made an exact science because no two men can be managed in the same manner, and each officer's personality is an essential factor. Every officer must acquire it for himself, largely through the medium of personal experience. This experience, however, does suggest some general ideas and methods. It seems that many of these should be of assistance to a newly graduated ensign. Some of the suggestions may be opposed to the policy of a certain ship, but they are merely intended as a general guide.

What follows is largely the result of conversation with older officers and observation of their methods. It may all be attributed to a chance remark of my first executive officer. He was discussing the general subject of handling men, and said: "Watch every officer with whom you are associated, because that is the way to learn to handle men. It is a study. Analyze the methods of a successful officer to see wherein his success lies. If an officer is unfortunate in his results with men, study him just as hard and learn what to avoid." That is the most important advice an officer can receive at the commencement of his career. Every one, sooner or later, gets this idea in some form or another, but not all leave the Academy with it as a concrete thought.

When analyzing the methods of others, to appreciate them one must know himself. Methods successfully employed by one officer may be totally unsuited to the character of another. An excellent example of this was afforded me a few years ago. A junior was assigned to a division commanded by an officer fortunate in his

results with men. The latter had a humorous but, in his case, effective method of holding men up to ridicule for certain minor offences. The junior was painstaking and most anxious to learn. He realized that he was in an efficient division and thought that he could not do better than copy *in toto* the methods of his senior. On the bridge, one day, as junior officer of the deck, he attempted the humorous in reprimanding a quartermaster for a small dereliction of duty. The situation thus created was so harmful to discipline that the officer of the deck had to take charge and request the junior officer to inspect the ship. Know yourself but remember at least that ridicule and sarcasm should be avoided by practically every officer.

In all relations with men, an officer must be firm, but square and consistent. This seems so obvious that the mentioning appears unnecessary. Nothing destroys the efficiency of a military unit faster than partiality. Above everything, an officer must be square.

An officer cannot be too strict and firm with men. If one is fair, he may be as taut with a division as he desires. One never gets from a body of men quite as much as he appears to expect. Require the best always.

Every one is prone to small inconsistencies, but gross inconsistency is a fatal defect. Breaches of discipline cannot be smiled away one day and rebuked the next. This will do as much as unfairness to destroy the ***morale*** of a command.

An officer is often greatly incensed at some action of an enlisted man. If he acts while in anger, he may say or do something that he will repent later. If he paces the deck a few minutes under these circumstances, he will find himself in a much better frame of mind to handle the situation.

When dealing with an angry man, one should give him the same chance. Send him away if possible to let him think it over. I once saw a man brought to the officer of the deck by a boatswain's mate because the seaman refused to scrub a gangway. The man could have been reported for court-martial then, but the officer of the deck saw that the man's sense of duty was entirely lost in anger. He ordered him to go forward and report in five minutes whether or not he intended to carry out his orders, warning him of the consequence if he refused. The man returned in less than three minutes glad and anxious to do as he had been told.

One should never talk to or argue with a drunken man. Turn him over to the master-at-arms for safe keeping until sober. This seems obvious, yet the following are the facts brought out before a court-martial in the case of an enlisted man. He was found drunk by the officer in charge of a shore patrol and was ordered to return to his boat. The man requested permission to arouse a shipmate before returning. The officer made mistake number one by granting permission. Later he returned to the same hotel to make another inspection and found the man lying on a bed sound asleep. The man was awakened and the officer then made mistake number two by reprimanding him at length for disobedience of orders. Finally the man commenced to curse the officer in the most profane language. He was tried for disobedience of orders and gross disrespect to an officer, and received the limit of punishment in the sentence of the court. If he had been taken to the boat in the first instance by the shore patrol, all the trouble would have been obviated. Incidentally, that was the first offence recorded on the man's record.

Men are frequently brought to an officer for refusing to obey the order of a petty officer because they regard it as unjust. There are only two questions to ask the man: "What was the order?" and "Have you done as you were told?" After he has completed the task, he should again report. Then is the proper time to investigate the justice of the order and to take disciplinary action on the petty officer, if necessary. Discipline requires that every lawful order received from competent authority be executed without question. The later investigation is necessary because in rare instances there are cases of persecution. General Grant once explained this to a private in the following way: "If an officer tells you to jump out of the window in the fifth story of a building, your only responsibility is to jump. It is the officer's responsibility to have a mattress or net to catch you when you land."

"Always obey the last order first" is an axiom that clears a situation sometimes confusing to both officers and men. Having received an order from an officer in authority, one receives a conflicting order from a second senior. If the latter is empowered to issue his order, it does not matter whether he is senior to or junior to the former. The course of action is very plain. The second senior is notified of the previous order. If he then repeats his order, it is executed first. The first senior is then notified of

the reason for the delay or failure in the carrying out of his order. For example, a destroyer is ordered by the commander-in-chief from Newport to Boston, and off Cape Cod falls in with a battleship, whose captain orders her into Provincetown. The commander of the destroyer reports the orders under which he is acting. If the battleship captain repeats his order, the destroyer goes to Provincetown and the commander-in-chief is notified at once of the fact with the reason.

The destroyer captain may request written orders, which the battleship captain must give him unless the situation prevents. If written orders are refused without explanation, the destroyer commander is at liberty to use his discretion about the second order.

Officers and men are often thrown in close personal contact for long periods of time. Naturally they engage in conversation. It is not to be expected that an officer will chase torpedoes in a boat for 12 consecutive hours without talking to his men. He should always command respect. Criticism of other officers, vulgarity, obscenity and profanity by men in the presence of officers are marks of disrespect that should not be tolerated. Reference to men by nickname is a familiarity that borders on disrespect and should not be permitted. There is one exception to the latter rule. If one is a member of the ship's athletic team, he should let the men understand that he is a football player when ashore for that purpose, and an officer on board ship. They will understand quickly, and football will gain accordingly, while discipline on board ship will not suffer in the least.

One wants his junior officers and petty officers to work enthusiastically. To that end, one should never air his knowledge by giving needless advice. This is very irritating to a man handling a job efficiently. On the other hand, if he needs help or suggestion one should not hesitate to give it to him. One must know his men, and in issuing orders only give detailed instructions where necessary. Allow a good man all the initiative possible.

If it becomes necessary to take direct charge of any job, one should notify the officer or petty officer concerned definitely that he "will take charge." Nothing creates greater confusion than starting to give orders over another's head without warning him that he has been relieved from direct supervision. Failure to give this warning usually results in two men issuing orders and always

creates a situation very irritating to the junior. A petty officer should receive the same treatment here that an officer would. When an officer shouts, he wants the men to jump. The quieter he is in his usual performance of duty, the more action he can get when the occasion demands. There are officers, however, who bawl at men when they want speed, even if the men are doing a job as quickly as possible. This is inexcusable. When men are busy and doing their best, they will finish more quickly if left alone.

If an officer makes a mistake, he should not hesitate to admit it, because nobody is right all the time. The more efficient an officer is, the more often he is right. So one should always try to be correct, but, if he is wrong, he merely compounds the error by trying to bluff it out. Some one has his number, and he merely loses the respect he could retain by gracefully admitting his mistake.

All military organization is based on the fact that no one man can directly control more than ten men. Take a regiment organization, for example. A colonel deals with three majors; a major with four captains; a captain (with the assistance of two lieutenants) with six sergeants or eight corporals; a corporal with the seven men of his squad.

In the navy the same idea is carried out from commander-in-chief through division commanders, captains, etc., until the division officer is reached. Here the idea is often lost to view because many divisions are handled without proper use and recognition of the petty officer. To make proper use of him, he must first be taught that the chevron demands that he exercise military authority over men. Too many coxswains and even boatswain's mates think that their rate means only a few dollars more on pay day. The first step, then, is to educate the petty officers and men of the division to the military responsibility and authority that the former must exercise.

A division should be organized and controlled very much as a company in the army, with only such variations as are inevitable on board ship. The first thing to do is to get the best man for leading boatswain's mate. He should be to the division what the first sergeant is to the company. We must remember the army saying that "the first sergeant makes the company."

The first petty officer should have a division book and, under the officer, exercise supervision over all division drills except bat-

tery drills. All orders of a general character should reach the division through him, and all division work should be directed by him.

The proper control of a division requires considerable paper work, such as lists which are the result of bag and hammock inspection, inspection at morning muster and details for work. The leading petty officer should have charge of these. Under the division officer, he should make all the working details. For example, no two coalings are alike. The first petty officer should be furnished with an elastic coaling bill, and from this should make the coaling detail each time.

The battery work is handled by the officer with the turret captain direct. With this the leading petty officer has nothing to do.

All divisional organization should be built around the petty officer. The divisional duties at fire, collision, abandon ship, fire and rescue, coaling and cleaning, should be divided into groups, and a squad under the supervision of a petty officer assigned to each group. This petty officer is responsible that all the duties of his group are properly executed. The division officer should rarely if ever reprimand an unrated man for mistakes at these exercises, but should deal with the petty officer. The latter, if worthy of his rate, will need very little reprimanding before everything is running smoothly in his group.

This grouping of work is easily accomplished at most drills, but is sometimes neglected at fire drill and at fire and rescue drill. It should never be overlooked. At fire drill, for example, adjacent hose crews should be under the command of a petty officer, as should crews to close groups of hatches, etc.

The cleaning bill is an excellent medium for conveying to the division the idea of military responsibility of a petty officer. This is accomplished by allowing him plenty of initiative. The space assigned the division for cleaning is divided, and each subdivision assigned to a squad under a petty officer. Each squad has its definite place to clean, including paint work, bright work, watertight doors, hatches, etc. The petty officer is told that he may make any detail that he desires to accomplish the work required of his squad. The instructions given the petty officer may be summed up in these words: "There is your work and there are your men. You are responsible to me that your compartments

are ready for my morning inspection. Divide the work as you wish, but remember that no matter what men are absent, everything in your compartment must be ready when I inspect." He is allowed to use his own initiative, but he alone is reprimanded when the work is not done. He may report men to the division officer when such men require disciplinary action, but such report does not excuse the petty officer. Such excuses as "Jones did not clean his bright work" and "That hatch is not cleaned because Smith is overleave," are not countenanced. There are other men in the squad, and the petty officer must see all the work done. It should be impressed on the division that this idea is to be carried out in all division work.

An officer sometimes encounters a petty officer whose only idea of getting a thing done is to do it himself. This man must be educated above this idea or disrated. For example, there is many a coxswain to whom an order to clean his boat means that he must get a bucket and swab and do the work himself. He must be taught that it is his duty to supervise the work and that the order means that he is to see that his crew turns to in the boat. When he receives such an order he should go to the first petty officer of the division and get the available men of his crew. It must be impressed on the petty officers that they may assist in the work, but that their primary duty is to see that the men of the lower ratings work.

Everything possible must be done to make the petty officer feel that his position is a distinct step above the unrated man. This is the first important point in his military education. To this end, he should be shown consideration that is not given an unrated man. He should never be reprimanded publicly unless his offence requires it. His bag and hammock should not be inspected with those of the non-rated men. When petty officers' bags and hammocks are to be inspected, a compartment should be roped off and every one else kept out. It should be explained to him that he need not line up at the mast with ordinary seamen and coal passers ahead of him to make a request of the executive officer. He should be encouraged to bring his request to the divisional officer, who would investigate it and personally carry it to the executive officer. These are merely a few suggestions. The petty officer should be dignified in every possible way in his own eyes and in those of

the men. Officers should give considerable thought to the accomplishment of this.

An officer should handle his division himself. By that, I mean he should keep his troubles at home. No commanding officer thinks well of the efficiency of an officer who continually has men at the mast for minor offences. Such a practice is not necessary and counts against the efficiency of a division. To keep all divisional troubles at home, the petty officers should be required to report to the divisional officer any difficulty that they may have with the men that may require the action of higher authority.

There are times when, for *important reasons,* an officer may want *important work* done that cannot be finished that day. Under these circumstances he may recommend to the executive that a man's name be taken from the liberty list in order that he may finish the work in the morning watch. By regulation, the division officer recommends his men for liberty, and so for special reasons he may recommend that a man be not granted liberty on a certain day. An example would be a man with a bag of dirty clothes at inspection. The division officer should endeavor to retain that man on board a sufficient number of days to allow him to get his bag in proper order.

An officer when assigning work should always do so by the piece, not time, *i. e.,* so many double-bottom pockets to clean instead of so many days there. He should cause the work to be inspected when reported completed.

At first these methods may not be fully understood in a division, but the men will soon accustom themselves to the division officer's wishes and will quickly realize that as they are not at the mast so often more of them are first class. It will soon appeal to them that while they must do exactly as required, they do not receive punishments that drag out over a period of months, as would be the case if they were classed.

Some cases have to be reported for the captain's action. In general they are so serious, though, as to demand court-martial action.

The idea that bluejacket divisions cannot be military is a mistake. Morning muster should be a military function. The men should be required to be in ranks when the assembly sounds. They should maintain immobility and silence while at attention, but should not be kept at attention longer than necessary to muster and inspect.

They should be deployed and ranks should be opened in regulation manner. A division officer should always insist on clean regulation clothes, clean shoes and clean person for morning muster.

The petty officers should be utilized to the fullest extent in maintaining a high standard of discipline at quarters. If the division officer finds it necessary to reprimand a man in ranks for talking, etc., or dirty clothes, the nearest file closer should be spoken to about it after quarters. He must understand the division officer will expect him to aid in the correction of such delinquencies.

There are occasions when men must be excused from quarters or when the whole division is engaged in dirty work that will last through the whole forenoon. The proper manner to handle this is through the first petty officer. He should report such facts to the division officer before 9 a. m., and the division may then be authorized to muster in dirty clothes that day or certain men may be authorized to be absent.

An officer must remember that he cannot have one standard six days in the week and a higher one on Saturday for captain's inspection. There have been cases of division officers who sent men in their turrets at captain's inspection because they lowered the standard of the appearance of the division. This practice would not be necessary if the division was always ready for inspection. It merely puts a premium on dirty clothes as a method of avoiding a long period in ranks.

A function should be made of bag and hammock inspections. The bags or hammocks should be dressed and the clothes laid out in accordance with the requirements in the Bluejacket's Manual, or bedding in neat and uniform manner. Men should be encouraged to keep neat bags or hammocks by excusing the best from two or three inspections. Bags not up to the standard should be put in shape before being stowed. This should be done under the supervision of a petty officer, who would require these men to stand by their bags until the division officer makes a second inspection about two hours after the first one. Especially poor bags should be scrubbed in the morning watch under the supervision of a petty officer. These bags should be laid out at morning muster every day for a week after they have been put in proper shape. If this procedure is followed, bag and hammock inspections will soon occupy very little of the officer's time or that of the division.

In general one standard, and that the best, is the way to run a division. Always be glad to see the captain at any drill or inspection.

If men fall below the standard required of a division, they should be transferred. They may do better in other surroundings. If too poor to transfer, a man should be discharged as undesirable. Before transferring a petty officer, an effort should be made to have the captain revoke his acting appointment.

In all an officer does he should attempt to build up divisional spirit. He should show an interest in the men and help them when possible. He should make it a practice to be at the mast when men of his division are on the report to say a good word for the man if possible. In general, after the men have become accustomed to his ways, he should endeavor in every possible manner to foster a pride among the men in their being attached to the division.

As a Watch Officer

The duties of a young officer naturally group themselves under two heads, the division and the watch. We will now consider the second of these.

Nothing marks an officer more quickly in the eyes of his seniors than the character of the watch that he keeps. Of course a watch officer must be thoroughly familiar with his authority and responsibility and the routine duties of a watch as contained in the Navy Regulations. A discussion of these topics does not come within the province of this paper. We are here concerned only with the watch officer's relation to the personnel, enlisted and commissioned.

The keynote of a successful watch is sounded in the word alertness. The officer himself must be alert and active because his actions while on watch are insensibly reflected by those of the men. It must be his constant thought to cultivate alertness on the part of his immediate assistants, the quartermaster, boatswain's mates, buglers and messengers of the watch. He should require all calls to be answered promptly. Two minutes is ample time for men to answer a call on deck, and five minutes for a boat in the water to reach the gangway after it is called away.

We will now consider in detail the methods by which the officer of the deck assures himself of this alertness and promptness so essential to the efficiency of his watch.

No man under the direct supervision of the watch officer should ever leave his post of duty without express permission. The quartermaster has to leave once an hour, and the boatswain's mate sometimes to see that an order has been executed, but no excuse should be accepted for failure on their part to request authority each time for so doing. These men are petty officers, so the only disciplinary action that may properly be taken when they transgress is admonition and private reprimand. If this is not effective they must be reported.

The officer of the deck should never prefix a word to be passed by the call "Boatswain's Mate." For example, an officer desires the word passed, "Lay aft everybody, whaleboat falls." The words in quotation marks are the only ones he should use and he should issue the order just once. The boatswain's mate must always be within hail and expectant of such orders. He will be less alert if he knows that when wanted his attention will be attracted by the words "boatswain's mate."

The messenger and bugler should always remain within hail of the officer of the deck and should never be called more than once. If a watch officer habitually calls them two or three times, they will never jump the first time he calls. They will take their time, secure in the knowledge that that officer will call again or come forward to get them.

The latter is an indefensible method of securing boatswain's mate, bugler or messenger. It is both undignified and inefficient. If an officer walks to the bulkhead door once for a messenger he will always have to do so.

If the commander-in-chief leaves the flagship in a 16-knot motor-boat to call on the captain, the officer of the deck will want the boatswain's mate, bugler and messengers in about ten seconds. The only way of being sure of getting them promptly in that emergency is always to require them in the same length of time.

If a bugler or messenger leaves his post without permission or is slow when called and does not improve after a warning, he should be made to stand on a certain designated spot for a while. This is done so that the officer of the deck may assure himself of having him at hand promptly when needed.

If a division is slow in answering a call for hands, or if the petty officer in charge of the call list of a division reports that he has no men available, he should be "allowed" to answer it him-

self and the first petty officer of the division notified of this action. Future experience will show that division prompt in answering calls and always with men for that purpose.

If a boat is slow in getting to the gangway when called away and the crew does not improve after one warning, the crew should be required to remain in the boat at the boom after it returns from the trip. When next called away it should be required to be at the gangway in three minutes. This will generally produce the desired effect. Another effectual method is to give the boat crew a little exercise at manning the boat by calling it away frequently during the remainder of the watch and timing its arrival at the gangway until this time is satisfactory.

At night in port, especially in cold weather, the signal bridge should be inspected frequently. If the men on watch are found in the chart house " writing up a signal," they should be brought aft on the quarterdeck, where they can stand their watch under the supervision of the officer of the deck. Two are stationed at fixed points on each side of the deck to observe the ships of the fleet. They are sent forward to send or receive signals, but return when that duty is completed. One or two such watches will ensure any officer an efficient signal bridge during his watch on deck.

The radio room should be inspected frequently also. The " static interference " will be reduced to a minimum during an officer's watch if he does so inspect. If the radio operator is delinquent the only action in his case is to report him.

Incidentally, signal officers and radio officers should make such inspections at least three or four nights a week. They should request the watch officer to call them at a certain time for that purpose. If they will do this, they will find themselves interviewing the captain less frequently on the inefficiency of their respective commands.

In matters of discipline, the corporal of the guard is used to enforce the orders of the officer of the deck on top side and the master-at-arms below. For example, if the word is passed for every one to shift into the uniform of the day, the corporal of the guard and the master-at-arms should be notified and required to report when the order has been executed in their respective parts.

The watch officer is personally responsible for the execution of every order that he receives. He may order a boatswain's mate

to take direct charge of the work, but this does not excuse him from assuring himself that the work is completed. This may be accomplished by personal inspection or by requiring such completion to be reported to him by the man in direct charge. Nothing irritates an executive officer more, and rightly so, than the excuse, "I told the boatswain's mate." Such a statement shows a total lack of comprehension of the fundamentals of naval discipline.

An officer cannot learn too soon that every officer has two personalities, the official and the unofficial. An officer who plays the "good fellow" on watch is bound to come to grief. Holding a boat for a brother officer who is late is one example. It is a poor excuse to offer the executive that his written order contained in the boat schedule has been disobeyed because another officer had requested it.

A young officer should also remember when a senior (as the captain or the executive officer) finds it necessary to reprimand him for an official mistake that the senior is acting in his official capacity and discharging his duties. The opinion that the senior entertains of the junior has probably not been altered, and there need be no change whatever in their personal or unofficial relations.

The officer of the deck is the official representative of the captain. By virtue of this fact every person on board ship is subject to his orders except the captain and the executive officer. This fact should be kept firmly in mind. It is human to remember that this authority only lasts four hours, but this thought should not prevent an officer carrying out to the letter the duties of his watch. For example, suppose the executive officer has ordered him to have the gunnery officer leave the ship at 7 a. m. for certain duty and the latter appears on deck at that time and reports he is not ready to leave the ship. The officer of the deck would be within his right if he positively ordered the gunnery officer into the boat. A more tactful procedure would be to request the gunnery officer to report to the executive officer that he is not ready to carry out the order. The officer of the deck should also report the fact to the executive. Execute every order or report to the officer issuing the order why this was not done.

The relation between the officer of the deck and the navigator is clearly defined. The navigator may advise, but cannot order the officer of the deck. One exception to this should be noted.

The Navy Regulations state that on soundings the officer of the deck shall regard the advice of the navigator as sufficient authority for changing the course, and shall at once report the fact of his having done so to the captain.

It is contrary to naval custom and courtesy for the executive officer to issue orders on deck direct to the men. This custom requires such orders to reach the men through the officer of the deck. If the officer of the deck is too busy, the executive officer might take charge of some operation, but naval courtesy requires that he notify the officer of the deck of what he is doing.

If the executive officer gives orders over his head needlessly, there are three courses open to the officer of the deck. He could speak to the executive when off watch and, if tactful, the matter would probably be quickly adjusted. The second method can best be understood from the following example. If the executive officer started to give orders to a steamer coxswain without acknowledging the officer of the deck, the latter should say to him, "Aye, aye, sir, have you any orders you desire me to give the steamer?" The executive officer will understand. The third method is one fading into disuse, but still justifiable in extreme cases. For example, in the case just cited, if the officer of the deck feels that the executive officer intended deliberately to slight him officially, he may offer the former the spy glass, saying, "Do you care to relieve me, sir?" This means, of course, that the officer of the watch desires that the orders pass through him or that he be relieved. Naval custom justifies him in that stand.

The subject of handling and controlling men covers an immense field and no attempt has been made to treat it in detail. This is a subject on which one cannot obtain too many hints and suggestions, so I trust that the reader may receive some useful help from what appears in this paper.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NOTES ON POLICY, MATÉRIEL AND PERSONNEL

By LIEUTENANT (JUNIOR GRADE) E. G. ALLEN, U. S. Navy

FOREWORD

Of all the branches of the Federal Government the navy is perhaps the most isolated and the least understood, for Americans as a whole are not a seafaring people and in general know little of naval matters. By virtue of these facts the navy becomes more or less its own criterion, it sets its own standards, it rises or falls in efficiency by its own efforts, and it is to the people of the country what it tells them it is.

It therefore becomes peculiarly important that the "Line," which as a whole carries the responsibility for what the navy is, should avoid mistakes and never deceive itself on any vital naval matter. For, when this occurs, there is no correction of the error, no criticising or scrutinizing authority to judge whether we are right or wrong, and error continues until some convulsion within the navy itself straightens the kink out.

How, then, are we to avoid mistakes and self deceit? How are we to progress properly and quickly? Three things are necessary: to know what we are to do, to wisely determine how to do it, and then do it by the best possible means. In other words, there becomes necessary: *policy, planning* and *method.* Add to these the leaven of *authority,* and we have four factors around which any successful organization must be built and with which it must function.

Our use of policy, planning, authority, organization and methods, then, is the lever by which the navy must be moved.

Of these the first, policy, is the key. It immediately shapes something determinate out of chaos. It gives a definite proposition, a sense of proportion. Policy shows the course to be steered.

Without it an enterprise is like a rudderless ship that answers every breeze with a following drift. Policy, then, is our origin, it implies planning. Planning induces methods to be put into effect by authority and organization.

* * *

The more one considers the ills of this democracy of ours, its people, its progress and where we personally are concerned, its navy, the more the word "policy," or rather lack of it, seems the clue to all our ailments.

As a nation, we seem never to have found ourselves, and after over a hundred years of development and of enormous increase in wealth and population, we are well entered on our second century of existence with probably as little idea of our relations to ourselves and to others as the embryo republic had in the year 1780. "We know not whence we come, nor why; nor why we go, nor whither."

While the solution of the republic's policy seems beyond the present generation, and while the navy has always been and always will be a reflection of the republic and its people, still a different situation holds in any military establishment, as a definite, continuous system of authority is in force and succeeding members in control have the same training and much the same ideas.

The navy, then, seems to have no excuse for a lack of internal policy in personnel and matériel, except the inability of its members to institute one and perpetuate it. This inability to institute a policy has been due to a large extent to the apathy of the commissioned line of the navy as a whole.

Since the year of the world-girdling cruise up to perhaps the present year the general sentiment has been that we were rather good and that our personnel, gunnery and general performance was well above average. The result seems to be that for the last five years, except for new construction and some advancement in certain material features and some War College influence, we have just been holding our own.

As a unit, we have to a certain extent been marking time, and will probably continue to do so until we know what we want to do, where we want to go, and have someone at the lead to plan and to direct and order in accordance with plan. The key of the situation is the old saw of our lack of a general staff or plan-

ning division possessing an executive member with authority to enforce a progressive scheme of development.

If the navy as a unit were saturated with this idea and would insist upon it, there is nothing that could prevent our getting policy, an executive general staff and progressive training. In this connection the navy's debt to the War College and to the men who have made and advanced its ideas is infinite, and if we are lifted from the rut any credit that may be due will be due to them.

This paper, however, is an effort to discuss policy as regards personnel and matériel. Rear Admiral Fiske has recently contributed a paper on the "Effectiveness of Skill." It is on this effectiveness of skill that the personnel question really depends. Owing to matériel fetish, we all tend to neglect the personnel question until the entire personnel of the navy is becoming thinned out and absorbed in the repair and upkeep of the establishment ashore and afloat. We are maintaining twice as much matériel, old and new, as we have personnel to man it and still effectively train ourselves for war. The condition is that of men being servants of ships instead of ships servants of men.

If the Administration does not provide for increases of personnel, policy, if we had any, would immediately insure an adjustment of ships to effectively man such first class units as we could with what personnel there is. We seem obsessed with the idea that we should always commission every hull the navy possesses, and that that in itself is a sign of virtue and of naval strength.

The result is that the department's and the fleet's energies tend to become frittered away in the repair and upkeep of ships instead of being exerted for the training of personnel, the acquirement of skill in the art of using ships in war. Our business of acquiring skill could be better accomplished by adequately manning six ships than in scattering that same amount of personnel for ship keeper on double the number.

Should not ships really have larger complements in peace than in war? Is not peace the training time when an excess is needed for new construction? In war should not complements be cut to the men needed to fight the ship, all excess being taken off as a reserve? It seems to me that excesses of men are no longer needed on ships to replace wounded or killed men. If a turret's

crew are killed, it must be assumed that a shell has pierced the turret and every place of the complicated gear in it is broken. In modern naval warfare, behind armor, when your personnel suffers casualties, their tools of war have suffered with them, and there is no virtue in carrying down in a sinking steel ship a 25 per cent excess of personnel.

After the adjustment of ships and men was made to meet present conditions, policy would next determine what additional personnel we need for new construction. The next paragraph in every appropriation bill to the authorization of two battleships should be an increase of 2000 men to man them. Every appropriation bill that increases the matériel establishment should carry an increase of personnel. If this were once established, it would become an unwritten law in itself for Congress and our personnel question would solve itself automatically, so far as number is concerned. One battleship, one thousand men; the one is dependent on the other, and the two are inseparable.

Policy in personnel implies consistent progressive training of men and officers, standardization of methods and an insistence upon the whole body keeping up to the standard and conforming to it.

Our weakest point in the treatment of both the personnel and matériel questions is lack of method, and not separating standard production from experimentation, and system and uniformity from undirected initiative.

In any large commercial plant or organization the experimental division is separated from the part that turns out or handles the uniform product. In our matériel establishment the two features are usually mixed. When we get a good product our tendency is not to use it uniformly, to standardize its use, but is rather to continue experimentation, and to vary the product in all possible ways while in use. The same men who are charged with turning out the good product are also directly concerned with the development of untried schemes. The condition lends itself to misfits.

As an example the question of turret hoists will serve, not because our hoists are not good, but to indicate our methods. We have had every form of hoist, and every young turret officer in the navy has probably tried his hand at experimentation and change. Yet any reliable form of hoist would have been satisfactory if standardized and developed, as time of flight, splash and

gas have made unnecessary anything but a fairly fast working, reliable, non-breakable type of gear.

Again, when we turn out a brand new ship, she supposedly is an up-to-date, modern-equipped weapon of war, fitted with the best we product. Expenditure on that vessel should then cease except the minimum necessary to keep her in repair. She has now become the creature of her speed, armor and date, her life as an efficient unit will last about as long as her matériel. When she is due for the reserve fleet, why lavish money on her when someone exploits a new idea, exchanging conning towers, replacing bridges, substituting 4-inch guns for 5, ripping out turrets, machinery and fire control, or even rearranging storerooms and quarters? The ship already is obsolete; her life cannot be lengthened by dressing her in new clothes. Sell, shoot at, sink, or give away; but why throw away money that could place new, effective units on the high seas?

This class of expenditure is, of course, due to the method of appropriating money. Congress, bureau appropriation, and the civilian political force that parasites around navy yards, and to whom ship repair is meat and life, are the three factors that wield the big influence; but unfortunately, we all lend the helping hand. Not so very long since, a definite policy was worked out and put into effect regarding the life of ships and their removal to the junk heap when replaced by new units. This should always be carried out, and when a ship tends to become a death trap by reason of her armor, speed and gun power, it is time to stop spending money on her for good and all and remove her from the first line fleet, where she is an incubus and is eating up the money that could replace her. If Congress could give us our present appropriation in a lump sum in three subdivisions: (1) new construction, (2) maintenance of personnel, (3) maintenance of matériel, with authority to expend on the first what we could transfer from the other two, the entire navy would turn to and save enough on the last to enable us to hold our place among naval powers.

The same general features in lack of policy apply to personnel. We are short on method and long on experimentation; short on standard development and long on zealous, undirected initiative. The standards of what an ordinary seaman is are measured only by the number of divisional officers of the navy; the standard of

the turret officer is a variable depending on the ship and individual. He is made not by method but by chance, he learns by absorption, not by direction.

As personnel, our business in time of peace is to acquire skill. The energy of the navy as personnel should in peace be concentrated on this, in systematic directed effort to elevate the whole mass and not by sporadic endeavors of individuals of the mass. Our profession is highly technical and is composed of many totally different branches and angles. This leads to the common opinion that it is beyond the scope of one man to become proficient in more than one branch. This I believe is erroneous, and is entirely due to lack of systematic training for the acquirement of skill. Our general method now is the individual contact, absorption and learn-by-failure method.

To illustrate, the old method (not yet obsolete) of training a torpedo officer was to take a young officer and isolate him in the torpedo room. After three or four years of isolated effort and the loss of more or less torpedoes, the young man becomes fairly proficient in the firing of his own mark of tube and torpedo. He is good, but his methods and results are his own, unfortunately accomplished at considerable expense of time and money. This man cannot be blamed for thinking his profession rather difficult and complicated, for he has spent a number of years in learning a part of one branch.

The new method is a five-month course on the *Montana,* where the young officer becomes proficient in firing all marks of tube and torpedo. The method, moreover, makes for standardization and advancement of the product, and it works.

Suppose we had similar instruction in turret training, tracking, fire control, spotting, mines, or what not. The sum total of the entire courses might average 24 months. Twenty-four months is a small proportion of a naval career to insure proficiency in many elements of skill and a knowledge of practical work in different branches. Our present system is to assume that we are proficient in skill instead of providing the facilities and assuring ourselves by the actual instruction that we are so. Elaborate theoretical courses that put the brand of "mystic" on the possessor are not needed. For this purpose we are interested not in theory, but in practical skilful operation of the tools of our profession.

The solution of the acquirement of skill and the systematic training of personnel is in our own hands. The standardization of the enlisted personnel could be started as follows: The present school system, which is purely academic, should be devoted to professional training. Give the present Aid for Education under the division of Personnel of the Department the necessary office force and charge of all drill books and all manuals for the training and instruction of enlisted men, with authority to revise them; direct the training and set a definite standard for ratings of ordinary seamen, seamen, etc. Appoint the fleet athletic officer his representative in the fleet as "Aid for Enlisted Men's Training." Appoint on each ship an officer for the same purpose. Enforce absolutely the present school period, and, by inspection and report, require the men to be up to standard, and set the standard high.

Unless some one branch of the department is charged with this duty and this alone, and is devoting his entire time to enforcing the training, we naturally will run along as we do at present, with countless well-meaning individuals each training men after his own ideas and according to his own standard. The result is that we never get anywhere, as we have no conception of what we want to do, nor any standard to maintain nor foundation from which to advance.

The War College, torpedo training ship, and proposed mine-laying instruction ship are steps in the right direction—monuments to the acquirement of skill. The post-graduate course is a child of the bureau's, a training place for fitting men for special technical jobs ashore, and does not answer the purpose of training the mass of turret officers and young engineers afloat.

If we took a mere fraction of the money we spend in stripping out and replacing fire control installations in old ships, and fitted a vessel with every form of fire control, plotting, battle-tracing and range-finding gear, and used it consistently in the hands of experts as a training vessel, in addition to having trained and standardized spotters and fire control parties, we would go farther in a year to solving all vexing questions of plotting, tracking and range-finding work than in a dozen years of conflicting work on different ships. The use of all the various gear alongside of each other would soon determine which was the better, and would fix definitely the standard and soon improve the product.

The question of training battery officers and pointers would have to be done ashore in the experimental plant and training overhaul station that we do not and probably never will possess.

When a vessel goes into overhaul, instead of expending time and effort in an endeavor to keep a vessel clean and to keep apace with the inroads of the yard force, all deck divisions should be withdrawn intact and put in barracks in the proposed training plant. Here turret officers, gun pointers and gun captains should be put through a month's course in the practical use and overhaul of all forms of turret gear, adjustment of sights, elimination of gun errors, etc. They would accomplish more in a month than in years of absorption aboard ship. Moreover, the course would react both ways, the experimental plant getting the benefit of all ideas afloat and the men afloat being turned out instructed, standardized, and with an intimate knowledge of gear and its latest practice, as all forms of matériel would be open and operated in the hands of experts.

When one considers the yearly problem of the target practice office to draw definite conclusions from the mass of conflicting data and results produced by various kinds of gear, of spotting, tracking, control and firing in use by its unstandardized gunnery, division and control officers, it is very evident that a god himself could not decide whether the dispersion on any practice was due to sight, gun, powder, trailing, spotting or training.

A serious effort should be made to concentrate the experimental branches of the service. Our present idea is to scatter thoroughly all new experimental features we undertake. If there is any value in an interchange of ideas, in *esprit de corps,* in the reduction of expense by systematizing and combining plants, in combining under one directive head the energy, brains and money needed to undertake and further experimental work, we seemed determined to discount it.

Such an experimental plant would work as a sifting ground for experimental ideas and gear, both for the service afloat and for civilian inventors and contractors ashore. It would relieve the swivel-chair bureauman from the practice of confounding his job of turning out the standard article with radical experimentation in untried machinery. Moreover, being constantly open to and used by the fleet, officers and men would be kept informed of the latest practice and proposed development of gear.

Congress contemplates a government armor plant on Staten Island. An enlargement of this project would enable all these features to be carried out in an ideal location. A considerable tract of land should be purchased, enough to isolate the station from the usual conditions that surround navy yards. If this cannot be done, the training plant for turret officers and gun pointers should be installed in the New York Yard. It is useless to say the instruction could be given aboard individual ships—the answer is evident. It is not and will not be given.

It seems to me that the most constant complaint from the fleet and the greatest cause of dissatisfaction and discouragement in the service at large arises from the fact that each year we start over where we began the year before, and do the same things, arriving at the completion of the year's training back at our origin, one cycle after another—no accomplishment, no advance.

The tendency of the entire service is to blame this condition on constant shifting and shortage of personnel, which really are made necessary to run this varying and expanding establishment of ours. Any navy that is expanding will have to undergo constant shifts of personnel. In our case, the condition is now slightly aggravated by a deficiency of personnel, but the real cause of the condition is deeper.

Suffering from lack of policy and direction, of standardization and uniformity of methods, of facilities for the acquirement of skill, we have no real foundation to stand on, and consequently find difficulty in advancing as a mass. One year one vessel sticks out above the average, the next year it drops back and another forges ahead, only to drop back in turn, the process being entirely a result of the individual efforts of one or two men.

Lack of policy, of direction, of coordination and of standardization of men and methods for the purpose of acquiring skill in our trade, is the answer to the dissatisfaction and discouragement of the fleet. The debt is not chargeable to the personnel we have not, but to the personnel we are. The onus is on us, and not on the farmer boys of the Middle West who have not yet enlisted. More personnel may make the naval machine work smoother, but it would only work in the same way and in the same direction.

It seems very apparent that whoever attributes our present relative efficiency to any special condition, or to any administration, man, or group of men, makes a mistake—for our present

status is the result of heritage. The truth is that we still try to run a billion dollar business with the old million dollar organization and methods. This is due to lack of policy, inertia, conservatism, apathy, or whatever term you choose.

With a sailing ship fleet, simple ordnance, and later with one or two classes of armored vessels and simple reciprocating machinery, the old methods of organization, of appropriation and of training and methods filled the bill. To-day, with a tremendously increased and increasing establishment, complicated by many classes of vessels and of propulsion, by new and complicated ordnance, by radio, aircraft, submarine, mine and torpedo, we have got to remould our business with budget appropriation, effective organization and its attendant planning and effective training and methods.

This specialization in instruction does not imply special corps or branches. Such special technical corps or branches as we have were due in the past to lack of facilities, inertia and the non-provision of methods to promote skill in these branches. The way to guard against them in the future is not to assume that any part of the profession is estranged or is difficult, but is to provide accessible facilities to acquire skill in these parts. This instruction will not make for specialization, but out of a bedlam of effort and ideas will produce unity of thought, method and attainment—will become a melting pot in which we make over raw heterogeneous material into the standard finished product.

We have reached a point where this navy of ours has grown so big and complicated that to have an economical and efficient establishment the entire service must be interested in and help along the lines of established policies and effective methods for personnel and matériel.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A JOB ORDER SYSTEM FOR THE ENGINEER DEPARTMENT

By LIEUTENANT G. J. MEYERS, U. S. Navy

The following description of a job order system originating on the *Birmingham* and used on the *Rhode Island* by the author is submitted as a suggestion for the basis of a standard on all ships. The job order pads and pocketbooks now issued by the Bureau of Steam Engineering are entirely suitable for the purpose. This system has accomplished an elimination of constant personal consultation between officers of repair stations and the senior engineer officer, the maintenance of a ready and simple record of work under way and work to be done, and the maintenance in two records of all work done, so that a ready reference to the history of a piece of machinery is at hand when any large navy yard job is being discussed.

JOB ORDER SYSTEM

The object of the job order system is to keep a record of—

(1) Work to be done.
(2) Work under way.
(3) Work finished.

Job order pads (form N. S. E. 169) as issued by the Bureau of Steam Engineering will be used.

Pads will be stamped at the top with the name of the station for which they are to be used, as follows:

(1) Starboard engine room.
(2) Port engine room.
(3) Fire rooms.
(4) Auxiliaries.

Job orders will originate with the senior engineer officer, first assistant engineer officer, and officers in charge of stations. They will be made out in duplicate. Except in an emergency, job orders will not be executed until initialled by the senior engineer officer, and in his absence from the ship for more than 24 hours, by the first assistant engineer officer.

When writing job orders, precede the order with the division under which it comes and stamp date on both copies. Piping begins and ends at boilers, pumps, condensers, traps, etc., and every valve on the pipe belongs to that pipe. Work done by machine shop, blacksmith, coppersmith and foundry will be under those divisions, no matter whom the work is for.

The following table will be the division used in preparing and filing job orders in order that filing and reference to them may be simplified:

FIREROOMS
- Boilers
- Piping
  - Main feed
  - Aux. feed
  - Main steam
  - Aux. steam
  - Aux. exhaust
  - Salt water
  - Steam drains
  - Main drain
  - Secondary drain
  - Bottom blow
- Pumps
  - Ash ejector No. 1 F. R.
  - Ash ejector No. 4 F. R.
  - Aux. feed No. 2 F. R.
  - Aux. feed No. 3 F. R.
  - Aux. feed No. 5 F. R.
  - Fire and bilge No. 6 F. R.
- Blowers
- Ash ejectors
- Bilges
- Double bottoms
- Bunkers
- Traps
- Bulkheads, etc.

ENGINEROOM—(Starboard)
- Main engines
- Piping
  - Main feed
  - Aux. feed
  - Main steam
  - Aux. steam
  - Aux. exhaust
  - Main exhaust
  - Steam drain
  - Salt water
  - Main drain
  - Secondary drain
  - Oil piping and tanks
- Pumps
  - Main air
  - Main circulating
  - Main feed
  - Hotwell
  - Fire and bilge
  - Shaft bilge
  - Aux. air and cir.
- Main condenser
- Aux. condenser
- Jacking engine
- Reversing engine
- Traps

- Air compressors
- Bilges
- Double bottoms
- Storerooms
- Hatches and bulkheads
- Feed heater, grease extractor
- Feed tank

ENGINEROOM—(Port)

- Main engines
- Piping
  - Main feed
  - Aux. feed
  - Main steam
  - Aux. steam
  - Aux. exhaust
  - Steam drain
  - Salt water
  - Main drain
  - Secondary drain
  - Oil piping and tanks
- Pumps
  - Main air
  - Main circulating
  - Main feed
  - Hotwell
  - Fire and bilge
  - Shaft bilge
  - Aux. air and cir.
  - Flushing
  - Hermes ejector
- Main condenser
- Auxiliary condenser
- Jacking engine
- Reversing engine
- Traps
- Air compressors
- Bilges
- Storerooms
- Hatches and bulkheads
- Feed heater, grease extractor
- Feed tank

AUXILIARIES

- Dynamo engines
- Dynamo condenser
- Ice machine
- Evaporators
  - Evaporator feed heater
- Distillers
- Ash hoists
- Launches
  - 1st steamer
  - 2d steamer
  - 3d steamer
  - 1st motor boat
  - 2d motor boat
  - Spare engine
- Piping
  - Aux. steam
  - Exhaust steam
  - Salt water
  - Steam drain
  - Heating
  - Whistle and siren
  - Air
- Pumps
  - Air and cir. (dynamo)
  - Cir. ice machine
  - Cir. distiller
  - Feed evaporators
- Uptake compartments
- Washrooms
- Laboratory
- B. S. Shop
- Foundry
- Coppersmith
- Traps
- Anchor engine
- Steering engine
- Machine shop
  - Work outside
  - Repairs

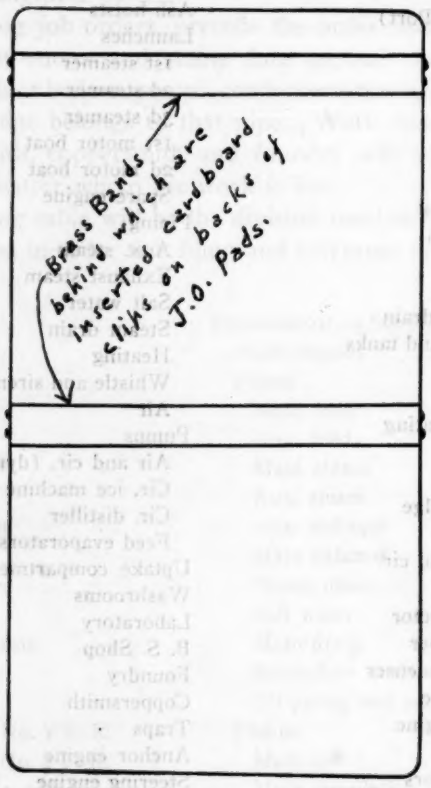
MISCELLANEOUS

- Anything not covered above

The four job order pads for the stations enumerated above, viz.: Starboard engine room, port engine room, fire rooms, auxiliaries, will be kept on a board made for the purpose, the board being kept on top of the closet below the job order bulletin board. On

the back of this board holding job order pads will be kept a sheet showing enumeration of machinery, etc., on each station as given above.

Ordinarily all job orders will be scrutinized by the senior engineer officer, but in cases requiring consultation the officers in charge of stations will bring the item of work to the senior engi-



J. O. BOARD FOR HOLDING FOUR (4)
J. O. PADS

neer officer for a decision as to when and how the job is to be done, before writing the job order.

After the job order is initialled by the senior engineer officer it will be stamped by the messenger of the third section with the date of issue in the lower left hand corner, and placed on the job order bulletin board under "New Orders." The officers in charge of stations will, when they have scrutinized the job orders, place them under "Unexecuted Orders."

When a job order is started, the officer in charge of the station will place the original under "Work Under Way," and retain in his job order pocketbook the duplicate copy of the job order.

A job order pocketbook (form N. S. E. 169-C) as issued by the Bureau of Steam Engineering will be kept by each officer in charge of a repair station. All job orders under way will be carried in this book, so that when relieved or absent the officer

may turn over to his relief without delay a complete record of work under way on his station.

When the job order is finished the duplicate copy will be turned into the office. The messenger in charge of third section will take the original from the board and stamp both copies in lower right hand corner with date of completion. He will then file the original under the machinery file which is contained in a 4-inch by 6-inch card index drawer, and the duplicate will be filed by pad and individual number in the covers provided (form N. S. E. 169-B).

The original of an emergency job order will be placed by the senior engineer officer under " Immediate Execution " on the job order board, the duplicate will be sent to the officer of the station concerned.

NAVY YARD WORK

A ship's job order is made out for each navy yard job order issued with the navy yard number on its face. It is treated in the same manner as a ship's job order except that the duplicate copy is retained by the first assistant engineer officer until completed.

The navy yard job order is placed on file under " Navy Yard Job Orders Completed," being filed by number and replaced by " Summary of Estimated and Actual Cost " when it is received.

In this way all work is accounted for at all times, and by consulting the machinery index a complete history of any piece of machinery is readily found for work done by ship's force and navy yards.

REPAIRS FOR OTHER SHIP'S DEPARTMENTS

The following directions will be followed in carrying out the provisions of paragraph 2, article 2808, U. S. Navy Regulations:

When a head of department desires repairs to any article in his department, he will write out a job order stating what is to be done and initial it.

Attached to the job order will be a memorandum request on the general storekeeper for any material required.

Any sketches that may be necessary for a complete understanding of the job will be attached to the job order.

When a sample of the article to be repaired is necessary the word " sample " will be written on the face of the job order.

The engineer officer will obtain the material required and will send for any samples that are necessary after he receives the job order.

The job order will be sent to the executive officer's office, and if he approves it, it will be sent to the engineer officer's office.

Job order pads will be furnished by the engineer department, and these pads only will be used for writing job orders.

In cases where the engineer officer will not supervise the work the remark on the job order, " supervised by " over the initials of the officer requesting the work will be interpreted to mean that

the engineer officer is to send a competent man to do the work. The absence of these words will mean that the work is to be supervised by the engineer officer.

When the job order is approved by the executive officer, it will be sent to the engineer's office and take the same course as job orders in the engineer department.

As all repairs are urgent, they will be performed as soon as possible, but for work that should be done immediately the head of the department will consult with the engineer officer, who will use his best endeavors to have the work started immediately.

Upon the completion of a job the article will be sent to the head of the department concerned, and if not satisfactory he will immediately consult the engineer officer. In absence of any comment from the head of the department, the job order will be filed as "Work Completed" in the engineer's office.

From the daily record of job orders under "Work Under Way" and from job orders turned in as completed, the daily record of work required for the log is compiled.

Each officer on a repair station will hand in to the senior engineer officer a description with sketches, material required, etc., whenever the occasion arises, of work beyond the capacity of the ship's force. Each item of work, after being inspected by the senior engineer officer, is entered on a pad made up of forms as follows:

Item (No.) (Description of work to be done).
Reason.
Work to be done by the ship's force.
Work to be done by the yard force.
Material required.

This pad is kept by the senior engineer officer, and when it is required to send in a list of repairs to be done by the navy yard, the list is practically complete and needs only to be put in smooth letter form.

Brass brads are driven into the job order bulletin board to hold the job orders. In order to keep job orders from flying from the brads a string tied to tacks over the middle of each column is tied at the bottom end to a small rubber band which is stretched and hooked over a tack at the middle of the bottom of each column. Job orders may readily be shifted by lifting aside the string.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE OPERATIONS AROUND PORT ARTHUR

Part II. Including the Eighth Attack

THE OFFICIAL VERSION OF THE JAPANESE GENERAL STAFF

Translated by Captain W. T. Hoadley, U. S. M. C.

THE SEVENTH ATTACK ON PORT ARTHUR

Commander-in-Chief Togo, knowing that the object of the second blockade was not fulfilled and fearing that the enemy's ships would escape to Vladivostok, on the 28th of March, when he arrived at the northwest coast of Korea, ordered Admiral Kamimura to watch with the second, third and fourth divisions. He ordered Admiral Kataoka, of the third division, who was in the Straits of Korea, to guard those straits; also he ordered the *Heien* and the *Atago* to join the seventh division, which was in the Daidoko (River). On the 29th again he requested of imperial headquarters that blockading ships be furnished. Before conducting this blockade, he desired to plant mines off the entrance to Port Arthur. On the 7th day of April he issued orders relating to the seventh attack, but from the 8th day of April, which was the day to begin the attack, until the 10th, on account of a strong southerly gale which kicked up heavy seas, making the operation dangerous, it was postponed by Admiral Togo. On the 11th, the auxiliary cruisers *Nichin* and *Kasuga Maru*, voyaging from Kashu, joined his command. On this day, the weather becoming settled, the operation was opened. The first and third divisions, the second, fourth and fifth destroyer flotillas, and the special service ship, the *Koryo Maru* (mine ship) arrived at a point about 25 sea miles southeast of Round Island on the afternoon of the 12th. The fourth and fifth destroyer flotillas and the fourteenth torpedo-boat flotilla, together with the *Koryo Maru*, began preparations to lay the mines. At 40 minutes past 5, the second destroyer flotilla proceeded to Port Arthur. At this time, on

account of overcast skies and a mist hanging over the sea, the weather was ideal for planting the mines. Commander-in-Chief Togo from the foremast of the *Mikasa* made signal saying: "We pray for the greatest success." Each ship manned the sides. The *Koryo Maru* replied: "If the weather is suitable we will surely have success." The ships then cruised to the westward.

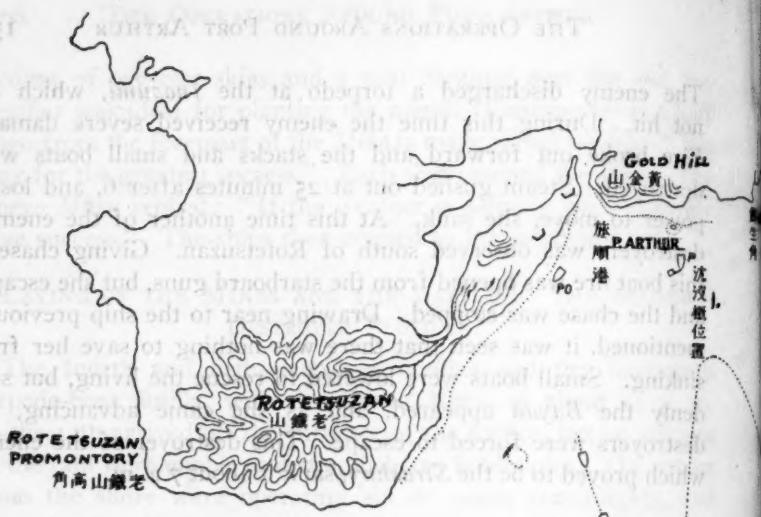
LAYING OF THE MINES AND THE BATTLE OF THE SECOND DESTROYER FLOTILLA

The fourth and fifth destroyer flotillas and the fourteenth torpedo-boat flotilla, with the *Koryo Maru,* at about 11 p. m. on the 12th arrived off the entrance of the harbor, but on account of the rain were unable to distinguish any landmarks. The enemy from the shore were operating six or seven searchlights, and seemed to be fearing an attack. Mine-laying ships often came within the searchlight rays, but fortunately were undiscovered. From starboard to port, one after another, the mines were laid in the desired zones. Each ship then returned to the northwest coast of Korea. The second destroyer flotilla, which had the duty to cover the mine layers, going ahead, proceeded to Port Arthur. The commander, fearing that he would get too far away from the mine-laying fleet, often slowed down on the way. At 40 minutes past 11 o'clock in the evening arriving to the eastward, they drifted about. At about this time, in the direction of Jotosan, he noticed a number of gun flashes. Being unable to see signs of any of the mine-laying ships the following morning, he conjectured that the work of laying mines was complete. Now, as he had no special duties, he proceeded to the south of Rotetsuzan at 5.50 a. m. on the 15th. About this time he discovered a trail of smoke on the horizon, which turned out to be a destroyer of the enemy returning to Port Arthur. At this juncture, forming single line ahead, changing his course to true west, he crossed ahead of the enemy. At about 15 minutes past 6, when the distance became about 1200 meters, the *Inazumi,* which was leading, opened fire. The other ships followed, and the enemy returned the fire. As the fire was not effective, gradually changing course to port the *Inazumi* was about 1000 meters from the enemy when she was struck by one of the enemy's shells forward and this shell exploding wounded four men. Seeing that the speed of the enemy was the greater they increased their speed and opened a fierce attack.

The enemy discharged a torpedo at the *Inazumi,* which did not hit. During this time the enemy received severe damage. Fire broke out forward and the stacks and small boats were destroyed. Steam gushed out at 25 minutes after 6, and losing power to move, she sank. At this time another of the enemy's destroyers was observed south of Rotetsuzan. Giving chase to this boat fire was opened from the starboard guns, but she escaped and the chase was stopped. Drawing near to the ship previously mentioned, it was seen that there was nothing to save her from sinking. Small boats were lowered to rescue the living, but suddenly the *Bayan* appeared, and as she came advancing, the destroyers were forced to escape. This destroyer of the enemy, which proved to be the *Strashny,* sank it about 7 a. m.

THE BATTLE CHALLENGE OF THE THIRD FLEET

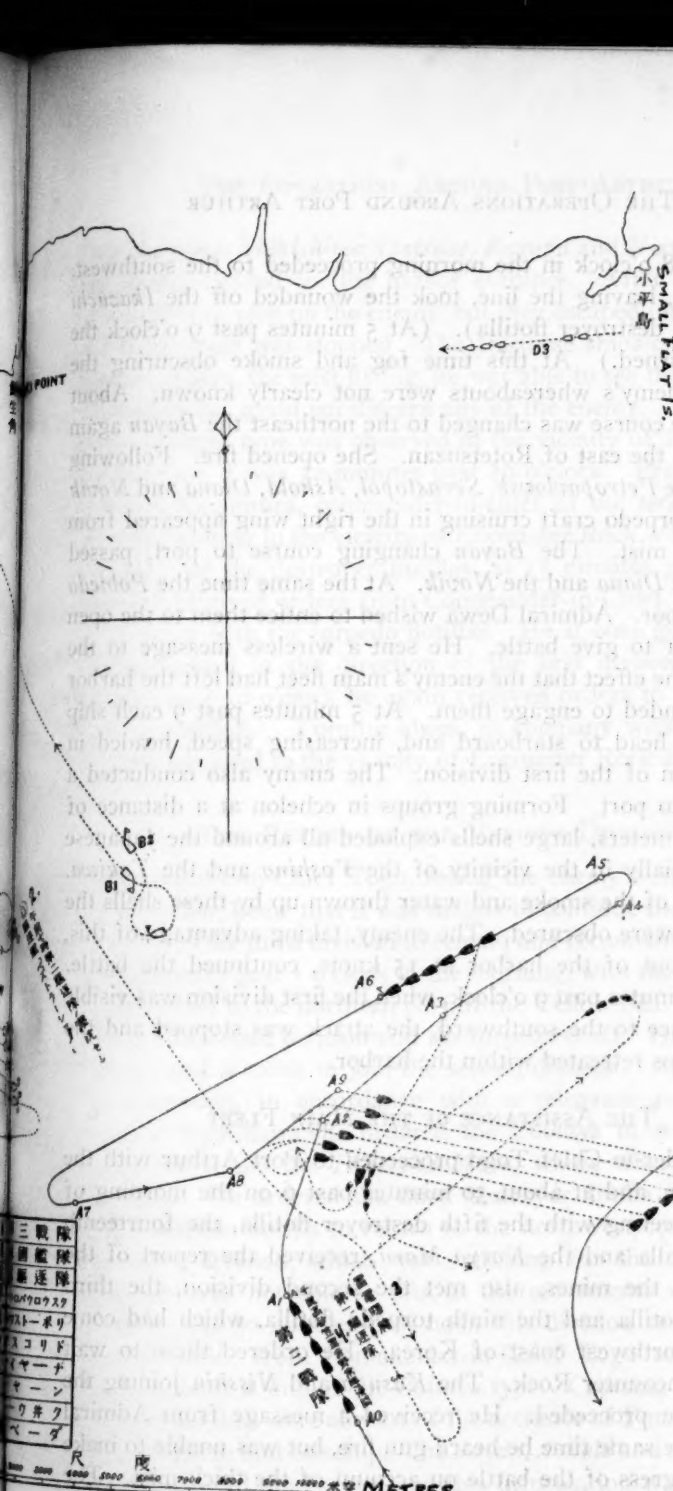
The third division, at 6.30 p. m. on the 12th, separating from the first division, proceeded to Port Arthur. The next day before daylight they discovered searchlights of the enemy. About 7 o'clock in the morning, seeing gun flashes in the vicinity of Port Arthur, they observed the Bayan outside the harbor cruising about. A short time afterward, in order to join with the second destroyer flotilla, they changed course to starboard. Two of the enemy's ships had appeared outside the harbor, also by black smoke arising from within the harbor, the enemy's ships appeared to be about leaving. The *Bayan* advanced directly towards the Japanese fleet and when at a distance of about 10,000 meters opened fire. Admiral Dewa at 20 minutes past 7 ordered the ships to engage. He also ordered the second destroyer flotilla to get out of range. The *Chitose, Takasao, Kasasagi, Yoshino, Tokiwa* and the *Asama,* single line ahead, increasing their speed, with their main battery guns engaged the enemy at a range of 8000 meters. The *Bayan* fought fiercely with all her guns. Drawing nearer, all fire was concentrated upon her, and she, in order to escape injury retreated to the entrance of the harbor. One shell struck on the port quarter and she took fire. At this juncture the Japanese stopped all fire. A number of the enemy's ships which were cruising from the northeast from the direction of Little Flat Island, proceeded to Port Arthur. The *Novik, Askold* and *Diana* left the harbor. In the vicinity of the harbor smoke floated to the heavens. The third



A. Third division
R. Russian fleet
D. Russian destroyers
P. Petropavlovsk
S. Cevastopol
a. Askold
d. Diana
B. Bayan
N. Novik
PO. Pobieda
1. Position of Petropavlovsk when she sank
2. Strashny sank at 7.00 a. m. (position)
3. The second destroyer flotilla
4. The third division

0	= 7h— 15	m	AM
1	" 7 — 20		"
2	" 7 — 30		"
3	" 7 — 35		"
4	" 7 — 48		"
5	" 7 — 55		"
6	" 8 — 15		"
7	" 8 — 45		"
8	" 9 — 0		"
9	" 9 — 5		"
10	" 9 — 20		"

X. The courses of the third division and the second destroyer flotilla and the assum



X. 明治三十七年四月十三日旅順港外ニ於ケル第三戰隊第二驅逐隊ノ航跡及ヒ敵艦隊想像航跡圖

nd the assumed courses of the enemy off Port Arthur, April 13

division at 8 o'clock in the morning proceeded to the southwest. The *Asama,* leaving the line, took the wounded off the *Ikazuchi* (the second destroyer flotilla). (At 5 minutes past 9 o'clock the *Asama* returned.) At this time fog and smoke obscuring the land, the enemy's whereabouts were not clearly known. About the time the course was changed to the northeast the *Bayan* again appeared to the east of Rotetsuzan. She opened fire. Following after her the *Petropavlovsk, Sevastopol, Askold, Diana* and *Novik* with nine torpedo craft cruising in the right wing appeared from out of the mist. The *Bayan* changing course to port, passed between the *Diana* and the *Novik.* At the same time the *Pobieda* left the harbor. Admiral Dewa wished to entice them to the open sea in order to give battle. He sent a wireless message to the *Mikasa* to the effect that the enemy's main fleet had left the harbor and he intended to engage them. At 5 minutes past 9 each ship turned her head to starboard and, increasing speed, headed in the direction of the first division. The enemy also conducted a movement to port. Forming groups in echelon at a distance of about 6500 meters, large shells exploded all around the Japanese ships, especially in the vicinity of the *Yoshino* and the *Tokiwa.* On account of the smoke and water thrown up by these shells the ships' hulls were obscured. The enemy, taking advantage of this, advancing out of the harbor at 15 knots, continued the battle. About 15 minutes past 9 o'clock, when the first division was visible some distance to the southward, the attack was stopped and the enemy's ships retreated within the harbor.

THE ASSISTANCE OF THE MAIN FLEET

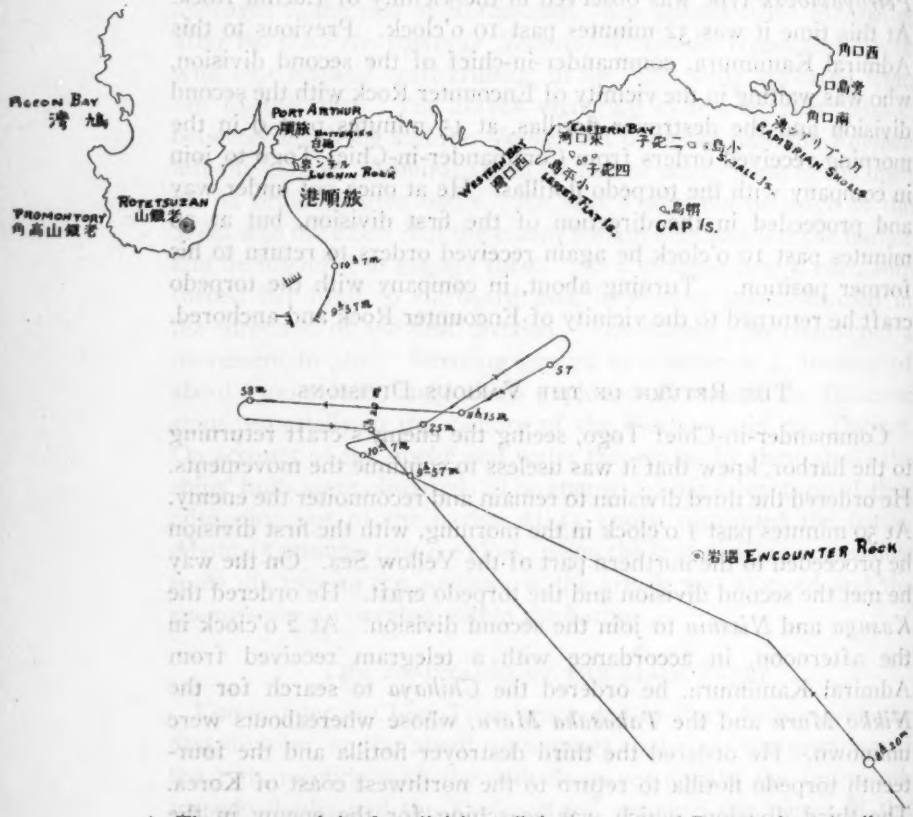
Commander-in-Chief Togo proceeded to Port Arthur with the first division, and at about 30 minutes past 6 on the morning of the 13th, meeting with the fifth destroyer flotilla, the fourteenth torpedo flotilla and the *Koryo Maru,* received the report of the planting of the mines, also met the second division, the third destroyer flotilla and the ninth torpedo flotilla, which had come from the northwest coast of Korea. He ordered these to wait south of Encounter Rock. The *Kasuga* and *Nisshin* joining the first division proceeded. He received a message from Admiral Dewa, at the same time he heard gun fire, but was unable to make out the progress of the battle on account of the thick mist. The commander-in-chief leading with the flagship *Mikasa,* the *Asahi,*

Fuji Yashima, Shikishima, Hatsuse, Kasuga and *Nisshin* in single line ahead, headed for the harbor entrance. After a short time he was able to pick up the enemy, but they escaped into the harbor and the pursuit was stopped. The Japanese ships cruised off the harbor. Later, the mist lifting, he was able to see the entrance of the harbor but could not discern any of the enemy. A ship of the *Petropavlovsk* type was observed in the vicinity of Luchin Rock. At this time it was 32 minutes past 10 o'clock. Previous to this Admiral Kamimura, commander-in-chief of the second division, who was waiting in the vicinity of Encounter Rock with the second division and the destroyer flotillas, at 15 minutes past 9 in the morning received orders from Commander-in-Chief Togo to join in company with the torpedo flotillas. He at once got under way and proceeded in the direction of the first division, but at 30 minutes past 10 o'clock he again received orders to return to his former position. Turning about, in company with the torpedo craft he returned to the vicinity of Encounter Rock and anchored.

THE RETURN OF THE VARIOUS DIVISIONS

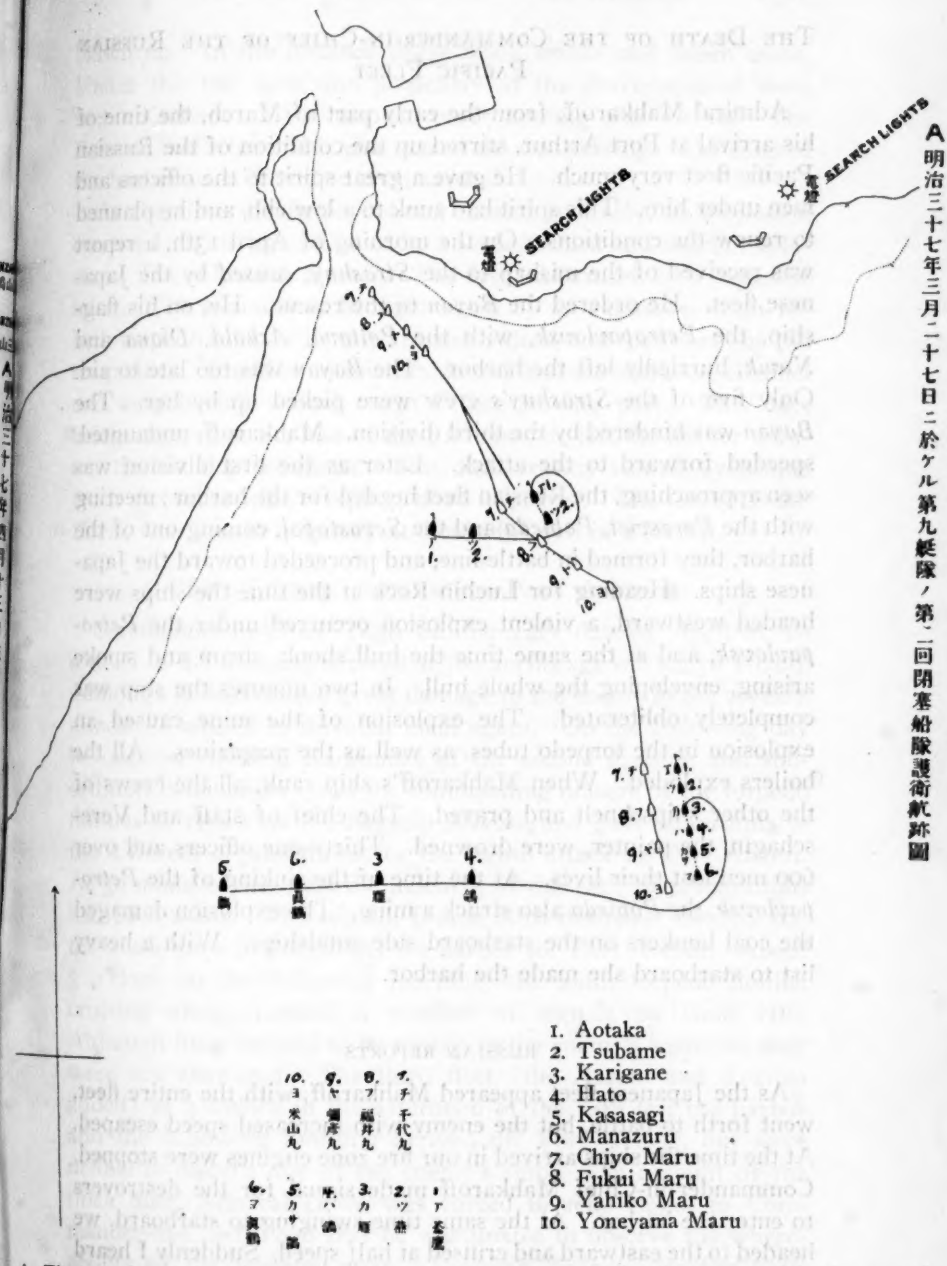
Commander-in-Chief Togo, seeing the enemy's craft returning to the harbor, knew that it was useless to continue the movements. He ordered the third division to remain and reconnoiter the enemy. At 50 minutes past 1 o'clock in the morning, with the first division he proceeded to the northern part of the Yellow Sea. On the way he met the second division and the torpedo craft. He ordered the *Kasuga* and *Nisshin* to join the second division. At 2 o'clock in the afternoon, in accordance with a telegram received from Admiral Kamimura, he ordered the *Chihaya* to search for the *Nikko Maru* and the *Takasaka Maru,* whose whereabouts were unknown. He ordered the third destroyer flotilla and the fourteenth torpedo flotilla to return to the northwest coast of Korea. The third division, which was searching for the enemy in the open sea, was not able to join in the movements with the first division. At 30 minutes past noon this division received a telegraphic notice from Commander-in-Chief Togo to observe the movements of a ship of the *Poltava* type. Crossing to the northward, when they were abreast of the entrance of Port Arthur, they were unable to find this ship. The *Bayan, Askold* and the *Novik* had already entered the harbor, and this information was transmitted

to Commander-in-Chief Togo. The *Chihaya* and the *Nihon Maru* were joined by the *Takasaka Maru,* which ship was later ordered to proceed to the northwest coast of Korea, and the other two ships joined the first division. On the 14th, the torpedo craft, the *Nikko Maru* and the *Koryo Maru* were ordered to take on coal and water. The first division leading, followed by the second and



A. The courses of the first division off the entrance of Port Arthur, April 13

third divisions, at 10 o'clock of the same day anchored to the northward of Kaiyo Island. That evening a report was received which stated that the flagship of the enemy, the *Petropavlovsk,* was sunk on the previous day and Commander-in-Chief Mahkaroff was lost. Also a report was received that the *Pobieda* had come in contact with a mine.



A. The courses of the ninth torpedo flotilla while convoying the ships engaged in the second blockade, March 27.

THE DEATH OF THE COMMANDER-IN-CHIEF OF THE RUSSIAN PACIFIC FLEET

Admiral Mahkaroff, from the early part of March, the time of his arrival at Port Arthur, stirred up the condition of the Russian Pacific fleet very much. He gave a great spirit to the officers and men under him. This spirit had sunk to a low ebb, and he planned to renew the conditions. On the morning of April 13th, a report was received of the mishap to the *Strashny, caused* by the Japanese fleet. He ordered the *Bayan* to the rescue. He, on his flagship, the *Petropavlovsk,* with the *Poltava, Askold, Diana* and *Novik,* hurriedly left the harbor. The *Bayan* was too late to aid. Only five of the *Strashny's* crew were picked up by her. The *Bayan* was hindered by the third division. Mahkaroff, undaunted, speeded forward to the attack. Later as the first division was seen approaching, the Russian fleet headed for the harbor; meeting with the *Peresviet, Pobieda* and the *Sevastopol,* coming out of the harbor, they formed in battle line, and proceeded toward the Japanese ships. Heading for Luchin Rock at the time the ships were headed westward, a violent explosion occurred under the *Petropavlovsk,* and at the same time the hull shook, steam and smoke arising, enveloping the whole hull. In two minutes the ship was completely obliterated. The explosion of the mine caused an explosion in the torpedo tubes, as well as the magazines. All the boilers exploded. When Mahkaroff's ship sank, all the crews of the other ships knelt and prayed. The chief of staff and Vereschagin, the painter, were drowned. Thirty-one officers and over 600 men lost their lives. At the time of the sinking of the *Petropavlovsk,* the *Pobieda* also struck a mine. The explosion damaged the coal bunkers on the starboard side amidships. With a heavy list to starboard she made the harbor.

RUSSIAN REPORTS

As the Japanese fleet appeared Mahkaroff, with the entire fleet, went forth to battle, but the enemy with increased speed escaped. At the time the ships arrived in our fire zone engines were stopped. Commander-in-Chief Mahkaroff made signal for the destroyers to enter the harbor. At the same time swinging to starboard, we headed to the eastward and cruised at half speed. Suddenly I heard two explosions. Some one exclaimed that the *Petropavlovsk* had

blown up. In the distance dense black smoke and steam arose. Under this the stern and propellers of the *Petropavlovsk* were seen. Outside of the torpedo craft nothing was visible. The *Pobieda* had a list and it was feared she was sinking. She entered the harbor with the other craft safely.

At the time the *Petropavlovsk* turned suddenly, an explosion occurred. This was followed by a second, third and fourth explosion. The ship sank at once. The first was caused by a Japanese mine. The second was brought about by an explosion in an 18-inch torpedo tube. The third by the boilers, and the fourth by the magazines. Previous to this Mahkaroff had the entrance, channel and neighboring waters swept before leaving port. This day, being angered at the loss of the *Strashny,* he left the harbor without the usual precautions. This disaster was viewed by people from the shore who, weeping, knelt in prayer. The Grand Duke Boris, who was in a battery at Gold Hill, fell in a swoon.

THE EIGHTH ATTACK ON PORT ARTHUR

Commander-in-Chief Togo on the 14th day of April at 10 o'clock in the morning arrived at the anchorage off Kaiyo Island. Although he had caused great damage to the enemy in the seventh attack, he wished to threaten them again. On the following day he ordered Admiral Kamimura of the second division and subordinate commanders, and the commanding officers of the torpedo flotillas to repair on the flagship *Mikasa* and gave commands to the different organizations for the eighth attack on Port Arthur. At 30 minutes past 7 on the morning of the 14th all preparations had been made. The second, fourth, fifth destroyer flotillas and the ninth torpedo flotilla left the harbor for Port Arthur. About 3 o'clock on the following morning, the ninth torpedo flotilla, cruising along, noticed a number of signals on Gold Hill. Although these seemed to be signals to the enemy's batteries, they were not answered. The third fleet (the *Asama* and *Tokiwa* added) at 4 o'clock in the afternoon of the 14th left the harbor and the following morning arrived off Port Arthur, but were unable to discern any of the enemy's ships. On account of the thick mist, Admiral Dewa was forced to send signal to Commander-in-Chief Togo that he was unable to observe the whereabouts of the torpedo craft. The first division, leaving their anchorage at 6 o'clock on the afternoon of the 14th, arrived off

Port Arthur at 8 o'clock the following morning. The *Kasuga* and *Nisshin,* leaving the line, engaged in indirect fire. The first division cruised to the southeastward of Rotetsuzan. The ninth torpedo flotilla were also drifting in the vicinity of the several attacking ships and were awaiting an attack of the enemy. The *Kasuga* from her firing position was throwing shells into the inner harbor from a point about south by west of Rotetsuzan. The *Nisshin* also from a position southwest of Rotetsuzan received information of the effect on the enemy by wireless. The shelling of both ships was very accurate. By a message received the effect of the fire was very good. The enemy replied to this fire by two improvised batteries which were created northeast of Rotetsuzan lighthouse. This fire was replied to by the *Kasuga* and *Nisshin.* Later these batteries seemed to be silenced. The indirect fire of the enemy from the inside of the harbor was not very effective. Commander-in-Chief Togo at 50 minutes past noon ordered the indirect fire stopped, and at 1 o'clock with the first division proceeded seaward and ordered the third division to follow. He ordered the second and fourth divisions and the fifth destroyer flotilla to cover the enemy should they follow. The ninth torpedo flotilla was ordered to return alone. At 1 o'clock on the 16th the various units, one after another, returned to the northwest coast of Korea.

THE THIRD BLOCKADE OF PORT ARTHUR

After the combined fleet had finished their engagement with the enemy at Port Arthur, they now prepared for the third blockade. The seventh division was dispatched to Daidoko to cover the landing of the first army. The zone to be patrolled by this division was the northern section of the sea off Daidoko. One part of this army had already landed on the southern bank of the Yalu River in order to hasten the occupation of Manchuria. At this time the army of the enemy had finished the defenses of Port Arthur, and also had completed the defensive works in Kinshu. The seacoast from Dalny Bay to the Yalu River was patrolled by soldiers. The Imperial Headquarters had already organized a second army. On the 15th day of April, Chief of Staff Ito gave orders to Commander-in-Chief Togo to carry out the third blockade at the same time that the army would land. The Commander-in-Chief, after he had finished the eighth attack on the 16th arrived off the northwest coast of Korea. At first he wished to operate in the vicinity of Vladivostok, and to attack the enemy's

ships. He ordered Admiral Kamimura of the second division to proceed to Vladivostok with the second division (the *Yakumo* and the *Asama* were absent, but the *Kasuga* joined this division), the fourth division (the *Izumo* added), the first destroyer flotilla, the special service ships, the *Nikko Maru* and *Kinshu Maru,* and the eleventh and fifteenth torpedo flotillas, which were then in the Korean Straits. (This was part of the original plan of operations against the Russian Vladivostok fleet.) He ordered Kataoka with the third division, which was then in the Korean Straits, and all units under his command to join off the northwest coast of Korea. Dewa with the first division and the third division (the *Asama* added) and the fourteenth torpedo flotilla, was ordered to pick out a landing place in the vicinity of Daidoko, which would be the landing place of the tenth independent division. The third division arrived on the 22d from the Korean Straits. From the 23d transports carrying the soldiers of the second army, one by one collected in the vicinity of Daidoko. On the 24th General Oka conferred with Admiral Togo relating to the landing of the army. Admiral Dewa after picking out the point for landing returned on the 26th. Commander-in-Chief Togo desired to have the army and the navy cooperate in the plans. He wished to crush the enemy inside the harbor as well as to carry out the blockade covering the landing of the army. The seventh division and the special service ship, the *Hong Kong Maru, Nikko Maru* and the twentieth torpedo flotilla were dispatched on the 3d to Daidoko. Occupying an advantageous place which would permit it, the army's disembarkation was begun. Admiral Kataoka with the third division, wishing to assist in this movement with the fifth and sixth divisions, special service ship *Tainan Maru* and the second, sixth, twelfth and twenty-first torpedo flotillas departed from the northwest coast of Korea. Arriving at Daidoko protected the second army. Commander-in-Chief Togo with the first and third divisions and the various torpedo destroyer flotillas, the ninth, tenth, fourteenth and sixteenth torpedo flotillas, the blockading ships prepared for the blockade of Port Arthur. First he swept the sea for mines and proceeded to the fleet base.

PREPARATIONS FOR THE BLOCKADE

Commander-in-Chief Togo, having attempted twice to blockade Port Arthur, was unsuccessful. Now planning another blockade on a larger scale, he requested Imperial Headquarters that he be

given at least 12 blockading ships. Imperial Headquarters directed that the following ships would be taken from the ships being used by the army: *Niihatsu Maru, Okura Maru, Asagao Maru, Mikawa Maru, Totomi Maru, Fusan Maru, Edo Maru, Nagato Maru, Otaru Maru, Sakura Maru, Sagami Maru* and *Aikoku Maru*. Collecting these ships in the vicinity of the main fleet, they received explosives from the ships of the main fleet and other preparations were carried on. On the 26th day of April everything was in readiness. As before, a great number of volunteers replied to the Commander-in-Chief's request, and there were not a few among those who volunteered who had not already taken part in the blockades. Commander-in-Chief Togo made very careful selection. Commander Mori was selected to command the blockading fleet. A great number of the officers chosen were officers attached to the third division and who were well acquainted with the conditions in the vicinity of Port Arthur. At midnight on the 27th day of April the first division, which had been divided into two sections, arrived in the vicinity of Port Arthur and reconnoitered the sea and land. On the 30th the crews of the blockading ships were transferred from their respective ships to the blockaders. These men were given instructions in regard to handling explosives. At noon on May 1st, preparations entirely completed, the blockade was on.

THE OPERATION OF THE VARIOUS FLEETS

On May 1st the combined fleet began the great battle preparations. The fifth and sixth divisions and the sixth, twelfth, twentieth and twenty-first torpedo flotillas, joining with the seventh division and the twentieth torpedo flotilla, which were at Daidoko, in order to convoy the transports of the second army, left the northwest coast of Korea. The other divisions, together with the blockading ships, at 5 o'clock in the afternoon got under way. Admiral Dewa, leading with the third division (the *Asama* and *Yakumo* added), took the lead. Commander-in-Chief Togo followed this with the first division. The 12 blockading ships had on their right wing the ninth, tenth, fourteenth and sixteenth torpedo flotillas. The *Akagi* and *Chokai* guarded the port flank. The second, third, fourth and fifth destroyer flotillas were on the right flank of the first division. The *Tatsuda* took her position to port of the first division for the purpose of communication. This

armada of over 50 ships proceeded to Port Arthur. On the way it was found to be impossible among the blockading ships to keep up the standard speed, so Commander-in-Chief Togo on the 2d ordered the divisions to decrease the speed. The sixth ship, the *Fusan Maru,* having a leak in her boiler, and being unable to remedy this, was ordered out of the line. Again the original speed was taken up. At 7 o'clock in the evening, when they arrived at the fixed point, the blockading ships were ordered to take position to port of the first division. Signal was made which read, "We pray for the greatest success." The various units of the first and third divisions manned the sides and the movement was opened.

CARRYING OUT THE BLOCKADE—DEPARTURE OF THE BLOCKADING SHIPS

On May 2d at 7 p. m. the *Niihatsu Maru* and the 11 other blockading ships separated from the first and third divisions; being convoyed by the *Akagi* and *Chokai* and the destroyer and torpedo flotillas proceeded to Port Arthur. About 10 p. m. the south wind increasing, kicked up a bad sea, which caused consternation among the ships. The commander of the expedition, on account of the dangerous conditions, and not wishing to jeopardize the lives of the crews, decided to stop. The *Niihatsu Maru* decreased her speed, but the movement in some manner became confused. Only two other ships, the *Okura Maru* and the *Nagato Maru,* conformed to the instructions. The remainder of the expedition, not knowing of the change, kept on towards Port Arthur. The wind increasing caused waves that swept the decks. Although the cruising was exceedingly dangerous, the ships continued. Arriving at their destination they proceeded to carry out their respective duties. The *Akagi* returned to find the other ships. After searching for some time, she proceeded to Port Arthur.

THE CONDITION OF THE BLOCKADE

The plans of the expedition commander were, as related above, more or less disarranged. The fourth ship, the *Mikawa Maru,* losing the other ships, at 2 a. m. on the 3d saw the searchlights of Gold Hill about six miles true north. Decreasing speed she waited for the other ships. About 2.10 a. m. when approaching the entrance of Port Arthur gunfire was heard in the distance. The

commander gave orders to proceed at once to the entrance. Being picked up by the searchlights, a heavy fire was directed upon him. Finally she came into collision with two defence booms at the left of the entrance and was blown up. The *Niihatsu Maru* observing the other ship changing course, thought it must be time to enter the harbor, so changed her course also, but in the darkness coming across some companion ships and in order to avoid collision changed course slightly. By so doing she lost trace of the ship she was following. She alone proceeded to Port Arthur. Later she met with the *Sagami Maru, Otaru Maru,* the *Edo Maru* and the *Aikoku Maru,* and got into formation with them. The *Totomi Maru* being ahead of this formation, advanced at full speed. When the searchlights were broad on the port beam, the enemy opened a severe fire. The helmsman was killed, and Lieut. Commander Honda took the wheel. When she entered the harbor entrance a shell from the enemy destroyed her boiler and steam chest. Smashing the foremast the steering gear was put out of commission. Fire broke out and the ship became unmanageable. With her head pointed west by south she sank in the center of the entrance. The ninth ship, the *Otaru Maru,* receiving orders to begin the blockade, attempted to follow the movements of her companion ships and ran upon some defence booms. Going ahead of the *Mikawa Maru,* with her head pointing northwest by west, she was blown up to the left of the harbor entrance. The eleventh ship, the *Sagami Maru,* followed the *Otaru Maru* and when close aboard the *Sakura Maru* headed to the westward and was blown up in the right side of the harbor. The twelfth ship, the *Aikoku Maru,* observed that her companion ships changed course. Hearing their whistles and also shouts, she was unable to make out what was wanted. Observing the *Sagami Maru* enter the harbor she followed under a heavy fire. When she arrived at the center of the entrance she struck a mine which exploded under her bottom. As the engine room and boiler room were destroyed, the commander of the ship wished to sink her in that position, and just as the anchor was dropped she was blown up. The seventh ship, the *Edo Maru,* changed course and followed her companion ships. At the time she was about to drop anchor Lieutenant Takayanagi, who was standing near the compass, was struck in the abdominal regions by a shot. The ship was brought to anchor by Junior Lieutenant Nagata. She was

blown up and sunk in the center of the entrance with her head pointing northwest by north. The third ship, the *Asagao Maru*, at first followed the *Niihatsu Maru*. About 4 a. m. on the 3d, she proceeded at full speed to the harbor. At this time seven of the blockading fleet had been sunk and the enemy were firing on the boats and ships engaged in the relief work. The *Asagao Maru* under concentrated fire of the enemy proceeded to the entrance. At 30 minutes past 4, running ashore under Gold Hill, she was blown up. The *Niihatsu Maru*, the flagship of Lieut. Commander Mori, obeying the orders to cease the movement, returned to Round Island. As only two other ships followed, he conjectured that the other ships had advanced. At noon on the 3d changed course. In order to aid the other ships in the blockade with increased speed he shaped his course in that direction, and at 2 a. m. arrived outside the harbor. At a point about five sea miles from Jotozan he discovered gun flashes. Then hearing gunfire he knew that the blockade was on. At this time his steering gear became jammed and the ship's head could not be held on the course. Stopping the engines, temporary repairs were made. The time was then 5 a. m., and as the eastern sky was light, he knew the opportunity was lost and proceeded to sea.

RUSSIAN REPORT

The Port Arthur correspondent of the *Russkoe Slovo* writes in substance:

About 1 a. m., hearing gunfire, I hurriedly ascended Gold Hill and from there I saw the enemy's blockading fleet. Our land batteries opened fire, but the enemy fearlessly advanced into the jaws of death. About 2.30 a. m. the first ship appeared, closely followed by a second. The enemy showed an intention to carry out their object. Before long the first ship was sunk. The crew, assembling in the bow, seemed to be reconciled to their fate and loudly shouted "Banzais!" The second, third and fourth ships were sunk. The sixth ship was sunk to the southward. The seventh ship, although fighting valiantly, was forced on account of the intensity of the searchlight rays to run aground. It was impossible to see whether or not the eighth ship had sunk. Small boats containing sailors of the enemy were bombarded by us and numbers were killed. The crew of the ship which was stranded

under Gold Hill, before they surrendered, attacked our soldiers. Sailors of another ship opened fire upon our rescuers when they were engaged in aiding the enemy.

THE ASSISTANCE OF THE CONVOYS

The *Akagi,* the *Chokai* and the various torpedo and destroyer flotillas on May 2d at about 7 p. m., separated from the first division. Joining with the blockading fleet, proceeded for Port Arthur, but meeting with a strong southerly gale, were separated from most of the blockaders. All made the best of their way. The fourteenth torpedo flotilla was divided into two sections. The *Chidori* and *Hayabusa* in the first and *No. 70* and *No. 67* in the second, after separating from the blockading fleet at 12.30 a. m. the 3d, proceeded. When about three chains distant from the harbor, they were discovered and fired upon by the enemy. Returning the fire, they were about to flee when a shot pierced the observation tower of *No. 67,* wounding two seamen. This same boat observing the fourth ship, the *Mikawa Maru,* and wishing to convoy her, proceeded towards the harbor. Again she was struck by a shell which, after piercing the starboard side, exploded in the engine room. Artificer Engineer Yoshigawa and one seaman were rendered unconscious by coming in contact with an electric current. Her engines were stopped. Again she was struck by a shell, but *No. 70,* coming to her assistance, towed her to the open sea. The *Chidori* and *Hayabusa* followed after the blockaders and advanced to the harbor entrance. The enemy, after the blockaders had sunk, concentrated their fire upon the rescuers. The *Hayabusa* rescued 30 members of the crews of the *Aikoku Maru* and the *Totomi Maru,* but in doing so lost one of her own crew. The *Chidori* picked up the crew of the *Edo Maru* and proceeded to the southward. The tenth torpedo flotilla at about 1.30 a. m. on the 3d, when about 2½ sea miles from the searchlight on Gold Hill, discovered the fourteenth torpedo flotilla engaged with the enemy. Drawing near she observed the blockader sink. At about 4.30 a. m. *No. 41,* when about one sea mile south of Gold Hill, discovered and picked up a boat of the *Mikawa Maru* containing 18 men. The ninth torpedo flotilla at 1.30 a. m. proceeded on their course. From about 2.30 a. m. they endeavored to observe the movements of the blockaders. At about 4 a. m. observed a ship of the *Asagao* type heading for the harbor. Later,

they observed a small boat headed for it, but this boat was picked up by a craft of the tenth torpedo flotilla. At the time of returning the flotilla was subjected to a severe fire. Searching about, nothing was seen. The flotilla when headed southwest received a severe fire from the enemy. The *Aotaka* was struck in the port engine room, the shell passing out through the deck killed one man. A fragment of a shell striking below the water line amidship on the starboard side, caused a leak. The *Karigane* and the *Hato* at once went to the rescue. The *Aotaka,* making temporary repairs, was able to get out of range unassisted. The sixteenth torpedo flotilla at 1.50 a. m. the 3d, arrived at the designated point and drifted about. Seeing the advance of the *Mikawa Maru* and the attack on the fourteenth flotilla, they opened fire on the searchlights on Jotozan. This was answered by the enemy. Large shells dropped all around the flotilla. The flotilla then took up the work of rescue. Battling against wind and waves, they proceeded to the harbor entrance and cruised about until dawn without success. Each flotilla, although rescuing some survivors of the *Mikawa Maru, Totomi Maru, Edo Maru* and *Aikoku Maru,* continued the search for others until dawn, but without success. Each flotilla under fire then escaped to the southward. The *Chidori, Hayabusa* and eleventh torpedo flotilla took the survivors and the dead to the *Asama* and then joined with the first division. Torpedo-boat *No. 70* with *No. 67* in tow, proceeded to Kaiyo Island. The second and third destroyer flotillas, which preceded the blockaders at 3 a. m. on the 3d, and the fourth and fifth destroyer flotillas at 1. 30 a. m. arrived at the designated point and cruised until dawn without success. At 8.30 a. m. met the third division and were ordered by Admiral Dewa to again proceed to the harbor entrance. Searched under a severe fire, but could find no survivors. At 1.30 p. m. joined with the first division. The *Akagi* and the *Chokai,* which guarded the left flank of the blockaders, unsuccessfully searched until dawn. Later joined the third division.

THE OPERATION OF THE DIVISIONS

The third division separating from the blockaders at 7 p. m. May 2 at 5.30 a. m., the following day arrived at the entrance of Port Arthur. The *Niihatsu Maru* was seen south of Rotetsuzan. From a point 10 sea miles away the coast line was obscured by a

heavy mist. At 6 a. m. the various units joined. A signal was received from the *Niihatsu Maru* to the effect that her steering gear was damaged and her helm was useless. Admiral Dewa ordered the *Akagi* to proceed to that ship and attempt repairs. The *Akagi* returned with the information that repairs were impossible. At 7.30 a. m. *No. 41,* the *Chidori* and the *Hayabusa* joined with survivors from the blockading fleet. Admiral Dewa ordered them transferred to the *Asama.* These ships in company with the *Akagi* were ordered to proceed to Kaiyo Island and to keep a watch out en route for survivors. Admiral Dewa at 8.40 a. m. ordered the destroyer flotillas to continue their search. At 9 a. m., changing course due east, met the first division and joined them. Admiral Togo with the first division previous to this proceeded to Port Arthur, but from 9 p. m. the 2d, the wind blowing heavily, he feared it would create damage to the army transports. He dispatched the *Yashima* to Admiral Kataoka. His intentions were wired to General Oka, commanding the second army. At 9 a. m., meeting with the third division outside Port Arthur, the reports were received. The various torpedo craft were ordered to Koryoku Island to await orders. The first division searched for survivors, but on account of the heavy mist met with no success. The destroyer flotillas which had instituted a further search at 1.30 p. m. returned. Commander-in-Chief Togo ordered them to proceed to Koryoku Island. At 3.30 p. m. the first and third divisions cruised to the eastward. In the vicinity of Encounter Rock two small boats were sighted. The *Asahi* and the *Fuji* were directed to investigate them. One boat belonged to the *Sakura Maru,* but the other furnished no clue to which ship she belonged. Both boats were damaged by gunfire. A great amount of fittings were floating about. These were picked up and the course was resumed. At 7.20 the *Okura Maru* was sighted to port and she was ordered to Kaiyo Island. On the 4th at 1.30 a. m. the third division arrived at a point west southwest of Choshi Island. Commander-in-Chief Togo with the first division at 7.30 p. m. anchored in the Eastern Bay of Koryoku Island.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE UNITED STATES NAVY IN MEXICO, 1821-1914

By Louis N. Feipel

CHAPTER VI

War With Mexico—Operations on the East Coast

Immediately after the surrender of Vera Cruz, a combined movement was made for the capture of Alvarado, which, after the two previously mentioned failures, was in this instance accomplished. General Quitman, with his brigade of volunteer troops, was directed to proceed by land, in order to cut off the retreat of the Mexicans, and especially to gain possession of the horses and mules in that region. Commodore Perry directed Lieutenant Charles G. Hunter, commanding the steamer *Scourge,* to proceed in advance with that vessel and blockade the harbor, while he himself followed with the other vessels more slowly, so as to cooperate with General Quitman when he should arrive in the rear of the town. But Lieutenant Hunter, reaching the bar on the 30th of March, allowed himself to be tempted by his zeal into an immediate attack upon the fortifications at the mouth of the river, instead of obeying the letter of his orders and simply maintaining a blockade. The next day, after a renewal of the attack, the Mexicans withdrew from the batteries and from the town, whereupon Lieutenant Hunter entered the river, captured four schooners, left a garrison to guard the place, and proceeded up to Tlacotalpan. This town surrendered without resistance. Thus was the apparent object of the expedition accomplished before the main force arrived. But the important purpose of drawing supplies for the army from this quarter was entirely defeated, as the Mexicans escaped with their animals before the land force could hem them in.

Commodore Perry arrived on the 2d of April, but his too active subordinate had left nothing to be done in the way of conquest.

Quiet possession was taken of the town and of such public property as had not been destroyed when the Mexicans evacuated the place. Sixty cannon were found, 35 of which were shipped and the remainder destroyed. Lieutenant Hunter was at once placed under arrest, and was afterwards, by sentence of court-martial, dismissed from the squadron for disobedience of orders. Commodore Perry then turned his attention to Tuxpan. It will be remembered that the brig-of-war *Truxton* was lost on the bar while maintaining the blockade of that place. Some of her guns were now mounted in the Mexican forts which defended the town, and it was rather a point of honor with the navy to retake them.

This expedition received no aid from the army. The *Raritan* (with a detachment of 180 officers and men from the *Potomac*), the *Albany, John Adams, Germantown* and *Decatur,* and the bomb-vessels *Vesuvius, Etna* and *Hecla,* were ordered to rendezvous at the Island of Lobos. Commodore Perry, in the *Mississippi,* accompanied by the steamers *Spitfire, Vixen* and *Scourge,* and the gunboats *Bonita, Petrel* and *Reefer,* with a party of 300 officers and men from the *Ohio,* sailed from Sacrificios on the 12th of April. Joining the vessels at Lobos, he arrived off the bar at Tuxpan on the 17th, and made preparations for an attack the next day. The larger ships remained at anchor outside, while the small steamers, the gunboats and about 30 barges crossed the bar without accident on the morning of the 18th. The whole force detached from the ships, forming the landing party, amounted to 1490 officers, seamen and marines, with four pieces of light artillery for land service. The whole was led by Commodore Perry on board the *Spitfire.*

The approach to the town was defended by two forts on the right and one on the left bank of the river, in very excellent position to sweep any force coming up stream. General Cos, of the Mexican army, was in command, and had under him a force of 650 troops. When the flotilla came within range of the Mexican guns the barges sheered off in order to land the detachment which was to operate on shore, under command of Captain S. L. Breese, while the steamers and gunboats moved up the river. The Mexicans made but a feeble defence. They fired from the forts, and also with musketry along the borders of the river; but as the American force came up, they rapidly fell back, deserting the batteries before the land party could get near enough to storm

them. The attack, therefore, proved entirely successful, and the capture was effected with a loss to the Americans of only three seamen killed and five officers and six men wounded. The guns and a quantity of ordnance stores belonging to the *Truxton* were recovered. The *Albany* and the *Reefer* were left to watch Tuxpan. The *Hecla* was sent to blockade Soto de la Marina, the *Etna* to Tabasco River, and the *Porpoise* and *Vesuvius* to Laguna. The plan of Commodore Perry was to occupy every point on the coast at which supplies could be sent into Mexico, and thus, by diminishing her capability of resistance, to aid the conquering progress of the army. In accordance with this plan, a large part of the squadron began cruising eastward as far as Yucatan, in order to complete the work of bringing under American authority the maritime towns in that region. The policy of the United States was also changed about this time. The entire coast being in our possession, and its towns either garrisoned or watched by a sufficient force, it was deemed advisable to open the ports again to the entrance of commerce, and to direct the revenues into our own treasury. The blockade was therefore raised. A naval force, however, was still necessary to maintain the new revenue system which was imposed.

During his cruise to the eastward Commodore Perry touched at the Coatzacoalcos River, where he found a fort mounting 12 guns, but deserted by its garrison. The fort was blown up and the guns destroyed. The bomb-vessel *Stromboli* was left to guard the place. Perry then proceeded to Laguna, in Yucatan. This port was opened, and Commander Magruder, of the *Vesuvius*, was appointed governor. The flagship *Mississippi* then returned along the coast and met the main squadron off Tabasco River. The port at the mouth of this river was likewise declared open, and Commander G. J. Van Brunt, of the *Etna*, was invested with authority as civil and military governor. The blockade of the Coatzacoalcos was also raised, and similar authority conferred on Commander W. M. Walker, of the *Stromboli*. Commodore Perry also ascended the latter river, and received the formal submission of several interior towns. He then returned to Vera Cruz.

Captain Mayo, who had been appointed governor of Alvarado and its dependencies, was active in securing the submission of many towns in the interior. Most of them voluntarily acknowledged his authority, and came peaceably under the new rule. But

in the case of one military expedition sent out to reduce a refractory town, one officer and five men were wounded on the part of the Americans. Otherwise, the extension of their authority over a considerable region was unattended with bloodshed.

In the vicinity of Tabasco, however, matters did not remain in so good a condition. With no immediate force to overawe them, the Mexicans began to collect in considerable numbers. They held possession of the town and constructed fortifications of no small strength at commanding points along the river. These indications of insubordination and hostility continued until it became no longer prudent to disregard them. Commodore Perry, therefore, planned another expedition against the enemy in this quarter. He arrived, on the 13th of June, off the river, with the *Mississippi, Raritan, Albany, John Adams, Decatur, Germantown, Stromboli, Vesuvius* and *Washington,* and the steamers *Scorpion, Spitfire, Scourge* and *Vixen*—the *Etna* and *Bonita* being already within the bar at their station. A large force from the several ships was, as usual, organized and placed in the barges. It numbered, in all, officers included, 1173, with seven pieces of artillery.

Commodore Perry transferred his pennant to the steamer *Scorpion,* which, together with the other steamers, took the gunboats and barges in tow, and began the ascent of the river on the 14th. No enemy appeared till the following day, when, about 12 miles below the town, the flotilla was fired upon by an armed force concealed in the chaparral on the left bank of the river. This fire was soon silenced by the guns and musketry of the vessels, and, night coming on, the flotilla lay there till morning. Some distance farther up, artificial obstructions were met with in the river, and opposite to them on the shore was a well-constructed breastwork, from which a strong body of Mexicans opened fire. Fearing that the steamers might suffer an inconvenient delay before being able to pass the obstructions, Commodore Perry determined to land at that point and force his way through to the city. The heavy guns of the flotilla raked the intrenchment of the enemy, and the landing was effected close by. In 10 minutes the entire detachment was formed on the shore, with seven pieces of artillery, which had been taken from the boats and dragged up a steep bank 20 feet high by the sheer strength of the men. Three more pieces were also landed from the bomb-vessels, and then with great eagerness and enthusiasm the column moved to the attack.

The progress of the Americans was slow, on account of the high grass and thick chaparral through which they were obliged to march, dragging, at the same time, their artillery with them. The outposts of the enemy were quickly driven in, and the breastwork was deserted without the forces coming to close quarters. The steamers had now passed the obstructions, and were able to cooperate with the land party. They boldly sailed on, receiving and returning the fire from the enemy's intrenchments as they passed by. About a mile farther up was a principal work of the Mexicans, situated on a commanding point, and defended by 300 regular, and as many irregular, troops. They stood fire but a short time, however, and then fell back upon their remaining defences. These consisted of another breastwork, a mile and a half from the city; behind that, about a quarter of a mile, a trench across the road, filled with trees, their branches sharpened and lapped; and a quarter of a mile still nearer the city, an extensive fortification commanding the river and the road, occupied by 400 artillery and infantry. These works were successively carried, with but a feeble resistance on the part of the enemy.

During this march of nine miles, the heat was exceedingly oppressive, and several of the men sank down from exhaustion, especially among those who were attached to the field-pieces. The other casualties were the wounding of two officers and seven seamen. The Mexicans had at least 1400 men in the action, of whom about 30 were killed. Commodore Perry's command entered Tabasco about 4 o'clock in the afternoon of the 16th. A large quantity of military stores was destroyed, the captured cannon were removed to the vessels, the powder magazine was blown up, and all the fortifications in and near the city were demolished.

As the enemy still hovered around Tabasco, it was necessary to leave a strong force to hold them in check. Accordingly, the *Scorpion, Etna, Spitfire* and *Scourge,* containing 420 officers and men, of whom 115 were marines, were directed to remain off the city, under the orders of Commander Abraham Bigelow. On the night of the 25th of June an attack was made by 150 Mexicans on the guard stationed in the main square of the town. But they were repulsed without loss to the Americans. On the same day a party of 20 seamen, while on shore, were attacked by 70 Mexicans, and one of the former was wounded, the enemy, however, losing one killed and six wounded. Small parties of the

enemy occupied the outskirts of the town, and it was therefore necessary that the detachments on shore should be continually on the alert. Lieut. Commandant W. D. Porter was also directed to burn the ranchos in the neighborhood of the town, in which the Mexican troops sheltered themselves. These were accordingly destroyed, to the number of 200.

At a village called Tamultay, about three miles distant, some 500 Mexicans were collected, and from this point as headquarters these annoying attacks were kept up. Commander Bigelow determined to dislodge them from this position and, if possible, to disperse them. Accordingly, on the morning of the 30th of June, he marched at the head of 240 men, with two field-pieces, in the direction of the village. When still a quarter of a mile from it, his command was assailed by a fire of musketry from both sides of the road, where the Mexicans had posted themselves in ambush. The column remained firm, and promptly returned the fire. The Mexicans continued to hold their ground until the artillery was brought up, when, after a few discharges, they broke and fled in confusion. The pursuit proved ineffectual, however, as the enemy were too well acquainted with the avenues of escape to be overtaken. The Americans lost two men killed and five wounded. The loss on the other side could not be ascertained. Two steamers, which had started up the river to cooperate in the attack, ignorant of the channel, grounded, and did not reach their destination until the battle had been decided.

This action brought hostilities to a close in this quarter, and shortly afterwards, the vessels were withdrawn, to resume their stations at the mouth of the river and at other points along the coast. Guerilla parties continued to disturb the inhabitants in the vicinity of Alvarado and Frontera, but no serious encounters occurred. The squadron, also, by this time had been greatly reduced, it being no longer necessary to maintain on the coast so large a force as had been assembled previous to the capture of Vera Cruz. The *Ohio*, the several frigates, the brigs, and a part of the sloops, had been detached from the squadron. In August the vessels remaining under the orders of Commodore Perry were the *Mississippi, Germantown, Decatur, Saratoga, John Adams,* five small steamers, four gunboats, and four bomb-vessels.

This account of the services of the navy during the Mexican War would not be complete if mention were not made of the

detachment of marines from the squadron, under the command of Lieut. Colonel S. E. Watson, of that corps, which served with the army of General Scott. This detachment joined the main army in the vicinity of the City of Mexico, in time to take part in those celebrated actions which resulted in the capture of the national capital. It was attached to the division of Major General Quitman, and was first brought into battle on the 13th of September, on the occasion of the storming of the strong fortress of Chapultepec and the fortifications which covered the Belen gate of the city. At the base of the hill on which Chapultepec is situated, and on the left flank, were two batteries of considerable strength, protected also by some solid buildings and a wall 15 feet high. It was at this point that General Quitman's division was to advance to the attack upon the castle. The storming party was selected from the different volunteer corps of the division, including, therefore, a part of the marine corps, and was placed under the command of Major Levi Twiggs, of the marines. A pioneer storming party of select men, with ladders, pickaxes and crowbars, was led by Captain J. G. Reynolds, also of the marines. Associated with these was also a storming party of regulars, detailed from General Twiggs's division, and under its own officers.

A heavy and prolonged cannonade had been maintained from various points upon the castle and its outworks, in order to open the way for the contemplated assault. On the morning of the 13th the concerted attack began with the different divisions of the army under the immediate direction of the commander-in-chief. General Quitman's command advanced over difficult ground, and with slight protection, under a heavy fire from the fortress, the batteries, and the breastworks of the enemy, the storming parties leading the column. The battalion of marines was also posted in a prominent position, where it could support the storming parties. The severe fire of the enemy soon showed its effects upon the advancing column. The brave and lamented Major Twiggs was killed on the first advance, at the head of his command. But there was no halting. The storming party rushed on to its desperate duty with resistless force, and entered the Mexican works. It was closely and ably supported. The Mexicans stood their ground with unusual resolution and courage. The contest was now hand to hand, swords and bayonets were crossed, and rifles were

clubbed. But the valor of the Americans still triumphed. These outworks were carried, and the way to the fortress from this direction was opened. The troops did not pause on this threshold of conquest, but pressed on and fought their way into Chapultepec to their brethren who had been equally successful at the other points of attack.

The marines accompanied their division in its progress along the causeway toward the Belen gate, and participated in the long and bloody battle by which this avenue to the city was finally opened. On the morning of the 14th, the division of General Quitman entered the city, being the first portion of the army to march into the Grand Plaza. The palace, now deserted by the Mexican authorities, was overrun with desperate characters bent on plunder. Lieut. Colonel Watson, with his battalion of marines, was ordered to clear it of these intruders and protect it from spoliation, which duty he promptly and successfully performed. This corps lost, in the actions detailed above, Major Twiggs and six men killed, two lieutenants and two sergeants wounded.

Lieutenant Raphael Semmes, of the navy, who served as a volunteer aid on General Worth's staff, and Passed Midshipman Henry Rodgers, who was employed in the same capacity on General Pillow's staff, also received high commendations from their chiefs for their conduct in the several battles around the City of Mexico.

Yucatan, one of the states of Mexico, had been permitted by the United States Government to occupy a neutral position during the war, and was thereby exempted from the evils of that war. But while thus situated, hostilities commenced, early in 1848, between the Indians and the white inhabitants of the state. It was a war of races, attended by the most shocking atrocities. The Gulf squadron, however, under Commodore Perry, with a humanity and success that did honor to our national character, extended protection, food and shelter to the fleeing white inhabitants, who were in reality a portion of the people of a country with which we were still at war.

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SEAPLANES: TYPES NEEDED IN THE NAVY

By LIEUTENANT (JUNIOR GRADE) R. C. SAUFLEY, U. S. Navy

Were it possible to build an aeroplane that would satisfy naval purposes completely, the essential qualities of such a machine might be found in the enumeration below:

(1) Capable of making flights of long duration.
(2) Capable of climbing very rapidly.
(3) Capable of flying at high speeds.
(4) Capable of flying at low speeds.
(5) Capable of quick maneuvers.
(6) Capable of rising from rough water.
(7) Capable of landing on rough sea.
(8) Capable of maintaining stability on rough sea.
(9) Adapted to observation work.
(10) Large arc of gun fire.
(11) Protection from rifle fire.

Obviously it is impossible to obtain a machine with all the above qualities, nor is it an easy matter to obtain satisfactory combinations thereof. Since, however, we are limited to combinations it remains for us to take the principal kinds of work that will be required of seaplanes, and endeavor to make our combinations accordingly.

The principal tasks to be required of seaplanes are as follows:

(1) Simple reconnaissances.
(2) Offensive and defensive action against other aircraft.
(3) Offensive and defensive operations against fortifications, etc.

SIMPLE RECONNAISSANCE: REQUISITES OF THE MACHINE

(a) Capable of being launched from ship.
(b) Capable of making flights of long duration.

(c) Capable of landing in rough sea and maintaining stability thereon.

(d) Good scope of observation.

(e) Capable of being hoisted on board.

Reconnaissance work is undoubtedly the main work of seaplanes operating with a fleet. This reconnaissance, however, will not be limited to scouting for the enemy's fleet or to locating the enemy's scout cruisers, but will no doubt extend to the patrolling of coasts, mine searching, etc., all of which is highly important. Unfortunately for the force having to make the reconnaissance, such a flight will not be without serious obstacles. If the aeroplane scout is to develop the enemy, it is more than likely that enemy aeroplanes will be developed too. Now, the object of a reconnaissance flight does not usually include offensive action—the main purpose being to bring information to the flagship. Thus the first additional requisite is introduced, namely, speed sufficient to avoid combat. It is at once seen, therefore, that a difficult combination is entailed—speed and endurance. Furthermore, it will be seen that if the reconnaissance machine is to land safely near the parent ship preparatory to hoisting in—land in seas that may be expected under cruising conditions—it must be able to fly at comparatively low speeds. Thus the second additional requisite is introduced, namely, a considerable range of speeds. For a reconnaissance machine to be able to fly at a low speed is imperative—if it is expected to make more than one scouting flight, that is, land safely after a reconnaissance is finished. To be able to make a fairly high speed is very desirable in order that it may escape the counter-attack that may be made upon it during its tour.

Furthermore, it will often happen that the scout seaplane cannot avoid combat with enemy aircraft operating in the immediate vicinity of the enemy fleet or naval bases. It will therefore appear necessary for the scout seaplane to carry weapons of offense, etc., to be able to maneuver quickly, and to climb rapidly. Thus the third difficult combination is introduced.

It is more than improbable that a reconnaissance machine can possess all of the above named characteristics. For naval service, however, we must have reconnaissance machines. It will be necessary, therefore, to sacrifice or modify some of the factors that would be very desirable in situations incident to reconnaissances

but not integral therewith. Accordingly it will be necessary to cut down the high speed, reduce armor and armament.

As stated before, the simple reconnaissance is one of the necessary feats of naval aviation, and since other qualities must be sacrificed in order to obtain a long-distance scout, it follows that, until naval aviation reaches a higher stage of development, the reconnaissance machine will have to take its chances in finding the enemy and at the same time avoiding combat with enemy aircraft.

OFFENSIVE AND DEFENSIVE ACTION AGAINST OTHER AIRCRAFT

The foregoing remarks on reconnaissance machines, admitting on one hand the inability of the long-distance scout to become efficient in actual combat, and on the other suggesting the probability of attack by hostile aircraft, make pertinent the necessity of an additional type of machine. Assuming that it be our naval policy to employ the long-distance scout, it stands to reason, the policy being a good one, that the enemy will employ it also. Again, assuming that the enemy employ a second type of seaplane to fight off or destroy our long-distance scouts, it then becomes incumbent upon us to adopt the same tactics. In other words, the fleet must carry seaplanes capable of offensive and defensive action.

A machine included in this second type will none the less have to be capable of being launched from the ship, of landing safely in a rough sea, and of being hoisted on board. Nor can it sacrifice any of the following: speed, climbing ability; nor should it have to make a great sacrifice of armor and armament. The "speed-scout" seaplane will have to be equipped with bomb-dropping device, aeroplane gun and facilities for carrying a small supply of bombs. The latter may or may not be carried, according to the nature of the work. In aerial combat the principal use of the bomb is upon dirigibles rather than upon aeroplanes, and for this reason the weight of bombs may be omitted on some tours. The speed-scout will, however, have to sacrifice weight somewhere, and the most logical place is in the fuel carrying capacity, that is, in a decrease of cruising radius. It will also be noted that a high speed machine, of great climbing ability, will have to be high powered. Now, in as much as an increase of power means an increase of weight (not necessarily proportional), this increase of weight in motor will necessitate a further decrease in weight of fuel. Also, the fuel consumption of the high powered motor

will be great, a fact causing further decrease in cruising radius. Therefore the machine designed for offence and defence cannot carry a large quantity of fuel and will have a small cruising radius.

OFFENSIVE AND DEFENSIVE ACTION AGAINST FORTIFICATIONS, ETC.

This type of seaplane, while a good adjunct to the aerial force of a fleet, is the least important. The chief value of the seaplane to the fleet lies in the former's ability as a scout. So far the extent of damage done by aircraft to fortifications is insignificant in comparison to the work accomplished in scouting, observation and spotting. This latter work can be efficiently done by the first two types of seaplanes described, or by a combined attack of both. The reconnaissance machine will lift a considerable load when the weight of fuel is taken into consideration. Now, while it is not intended that the long-distance scout be primarily a load-carrier, its ability to carry a considerable weight of fuel can be employed in carrying bomb-dropping devices, bombs, etc., instead of the normal load of gasoline. Or circumstances may sometimes make it unnecessary for the reduction in fuel load to be replaced by anything. In this event the reconnaissance machine's climbing ability is greatly increased and likewise its efficiency in fighting other aircraft. The appurtenances for bomb-dropping would doubtless be permanent or semi-permanent fixtures of the machine, and although the weight of fuel might be readily re-substituted in place of the bombs, the bomb-dropping device would become a useless encumbrance on a long reconnaissance flight.

It therefore seems the better policy to carry seaplanes particularly designed for offensive and defensive action against fortifications. Like the other types of seaplanes, it must be capable of launching from the ship, landing safely in a moderate sea and of hoisting on board. It must be capable of carrying a heavy load (bombs, bomb-dropping device, aeroplane gun and ammunition), should be armored and should permit a good scope of observation. Such a machine will necessarily be high powered, will carry a limited amount of fuel and will consequently have a short cruising radius. The operation of this type of machine should, where possible, be made in conjunction with the seaplanes designed for counter-attacks upon other aircraft.

It will here be noted from the fundamental formula of flight, $P=KSV^2i$, that for all seaplanes, the reduction of weight either by consumption of fuel or by dropping bombs and expenditure of ammunition, will reduce the speeds at which seaplanes can fly and will therefore facilitate safe landings at finish of tour.

Thus it is seen that there are three main subdivisions of seaplanes to be used in naval aviation:

(1) Reconnaissance seaplanes.

(2) Seaplanes, offence and defence against other aircraft.

(3) Seaplanes, offence and defence against fortifications, etc.

Assuming the above subdivisions of seaplane types, it obviously follows that the different types will require different characteristics. Let us now consider what characteristics are to be expected.

There are certain physical characteristics that must exist in all seaplanes to be of use in naval aviation, which are a result of design and workmanship independent of the special purpose to which the machine is intended, namely, streamline forms and minimum head resistance of parts, efficiency of lifting surfaces, etc., stability of pontoons on rough water.

In order to determine whether a machine is adapted to its work, it is well to consider the fundamental formula upon which flight is based. A reconnaissance machine will obviously be required to fly over considerable stretches of both time and distance. In order to do so it will have to carry a large quantity of fuel, that is, a considerable weight. Let us examine the fundamental formula, $P=KSV^2i$. There will be but little variation of K, which, as stated before, will depend upon the streamline form and finish of parts, camber, etc. Nor will there be a great variation in the angle of incidence, since nearly all aeroplanes must take their normal flights—to be safe—approximately within the limits of 4-6 degrees. As previously stated, the weight of a reconnaissance machine and its load, P, will be large, especially at the beginning of the flight. Therefore P, although steadily decreasing, will have to be considered as a constant rather than a variable. Consequently, the two quantities left to adjust are the lifting surface S and the speed V. With K and i practically constant and P initially large, it is seen that either S, or V or the product SV^2 must be large. In other words, there must be a large lifting surface and medium speed, or a medium

lifting surface and a high speed, or a compromise of each. At the first glance it would appear that the solution of the problem would be to have a large lifting surface. Examination, however, shows that with a large surface the speed would have to be very much reduced, unless the angle of incidence were made very small, which, as we have previously stated, safe flight precludes. In other words, it is dangerous to fly at high speeds in an aerofoil where load per unit area is small, on account of the low incidence necessitated. On the other hand, the requirement that the machine make long flights does not permit of a great reduction in lifting surface, S, since such a change would, for a normal incidence, necessitate a very high speed to gain the necessary sustentation for a heavy load, and since this high speed would necessitate more power, the additional power would increase the fuel consumption so as to reduce materially the cruising radius. Therefore the reconnaissance seaplane, being of necessity a weight carrier, must strike a compromise between the lifting surface S and speed V.

For present day possibilities and requirements, such a compromise should not cause such a decrease of load per unit area as to decrease the speed below 60 miles per hour, when the machine is at normal incidence. Another important point to be considered is that no matter what per cent of reserve the motor may possess, it must be designed to run at an economical fuel consumption at the machine's normal incidence and speed. Also, considerations of load will cut down the margin of reserve power, however advantageous that reserve may be, since the weight of the motor increases with the power.

The reconnaissance seaplane should therefore have a fairly large lifting surface, and a small margin of reserve power at its heaviest load.

SEAPLANES FOR OFFENCE AND DEFENCE AGAINST OTHER AIRCRAFT

The requirements, as set forth in the foregoing, and an examination of the fundamental formula, will show the general characteristics of this machine. The high speed required for such machines calls for a reduction of area per unit load. It must be a rapid climber; therefore the motor must possess a large reserve. Rapid climbing also calls for a reduction in weight of

fuel. The reduction of S has already called for an increase of power with its consequent increase of fuel consumption; the occasional employment of full reserve during combat will necessitate a further increase of fuel consumption. Therefore the cruising radius of the "speed-scout" seaplane will be reduced by two causes, namely, the weight limit in fuel supply and the high rate of consumption by the motor.

In the general requirements of the reconnaissance seaplane, it is to be assumed that the machine possesses fair directional stability and maneuvering qualities. In the "speed-scout," the latter qualities will become imperative in the combats that may ensue with the enemy's seaplanes and dirigibles. For this reason it may become necessary to sacrifice a portion of directional stability to maneuvering ability, bringing the center of keelplane pressure close to the center of gravity, reducing the rudder area and placing it as far from the center of gravity as is consistent with staunchness of structure. The position of the elevator will be governed largely by that of the rudder, and since maneuvering ability in vertical planes depends principally upon the propelling power, the proper area of the elevator may be reduced without risk of interference with other factors of control.

In view of the best information obtainable and such experience as the U. S. Naval aviators have had, stability, both lateral and longitudinal, has not interfered with the maneuvering qualities of the aeroplane and has, on the contrary, enhanced the latter on account of the great latitude permissible in banking and climbing, without the dangers of side slip or stall. The stability referred to is, however, that which is due to inherent qualities of the machine and not to automatic devices, which in their present state of development are unreliable.

Since the seaplane designed for offence and defence against other aircraft—the "speed-scout"—will be called upon for strenuous and sudden maneuvers in both vertical and horizontal planes, it follows that it must be built to withstand the sudden and violent stresses incident to the service. The performance of exhibition machines gives a fair illustration of what these stresses may be, and the frequent tragedies caused by a load wire, or drift wire, or a warp carrying away during a loop or dive, give sufficient examples of machines strong enough for ordinary flight but too weak for sudden maneuvers. The fact that the "speed-scout"

should be constructed very staunchly is not to be construed as implying that other types of seaplanes will not possess a good factor of safety, otherwise it may not be able to withstand even the stresses of gust action. The nature of "speed-scout" service, whose cruising radius is not designed to be great, not only precludes any dimunition of weight at the expense of the factor of safety, but makes it imperative that the latter be extra large.

SEAPLANES: OFFENCE AND DEFENCE AGAINST FORTIFICATIONS

A consideration of the requirements of this machine and of the fundamental formula of flight show that a modification of the reconnaissance machine would adapt the latter to the former. The cruising radius would have to make the principal sacrifice, that is, a large proportion of the weight in fuel would have to be taken up in armor and armament. The armament of this machine should be particularly heavy otherwise the bombs and explosives dropped upon strong fortifications or upon submarines might not be effective. Furthermore this type of machine will be subjected to rifle and shell fire more than any other. It should therefore be well armored, more so than any other type. Its climbing ability should be better than that of the reconnaissance machine, a necessity demanding a more powerful motor. Thus the cruising radius is further reduced by a heavier motor and a consequent higher rate of fuel consumption.

There are many details of design and structure upon which a positive statement, as to efficiency, would be ill-advised. Many features of designs, such as camber, aspect ratio and stream line forms are well set forth in standard books of reference such as Eiffel. The values in aeroplanes design, of lateral dihedral, inverted lateral dihedral, slope-back, etc., have been intelligently treated by several theorists, and, in fact, practical demonstration of some of these features are well made in the German Taube and the Burgess-Dunne. It appears more than probable that the finer points of aeroplane designs—those details upon which superiority depends—are not to be found in books of reference and certainly not in the popular advertisement of any special brand of seaplane. Therefore an efficient development of seaplanes for naval purposes demands consistent and comprehensive work on not less than three lines, namely:

(1) Keeping in touch with, testing and using the various types of machines and motors put upon the market.

(2) Conducting thorough experiments and tests of such aviation material as may appear useful—this especially for the development of design original to the navy.

(3) Having determined from the above the possibilities of a seaplane, make the specifications of contracts rigid, not as to detail but as to performance and results.

Of the three general types of seaplanes enumerated in the foregoing, it may be truly said that each is essential. The relative importance of the types may not be the same, but this fact should be no more of a barrier to a comprehensive register of aircraft than the relative importance of dreadnaught, battle-cruiser, destroyer and submarine to the completeness of the battle-fleet. The battle-fleet must have its fast squadron, its scout and its screen; nor will this rule be carried amiss if applied to the fleet of the air. There is no use doing a job halfway; if we are going to maintain a battle-fleet, the air-fleet should be kept with it, and the air-fleet, whatever may be its size, should be developed upon a comprehensive scale. A dearth of reconnaissance seaplanes may sometimes prevent a desired contact with the enemy fleet. A dearth of "speed-scouts" on our part may sometimes permit the enemy seaplane to return unmolested with information that would bring about a contact disadvantageous to our fleet, or when before a hostile fortified coast, may prevent the necessary diversion of enemy aircraft in order that our heavily armed and armored seaplanes may harass the enemy's trenches and drive his gun-crews to shelter.

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EASY METHOD OF BRINGING STAR DOWN TO THE HORIZON IN TAKING STAR SIGHT

By LIEUTENANT JOHN J. LONDON, U. S. Navy

In taking a star sight, the greatest difficulty is in bringing the star down to the horizon. This is often very difficult, and sometimes impossible where the star is indistinct, or where the star has to be brought down through a bright sky. Under the above conditions, a person inexperienced with the sextant will find it impossible to take a sight, and often an expert with the sextant cannot succeed in getting the star down to the horizon.

This method consists in bringing the *horizon* up to the *star*. It was called to my attention by Captain J. S. McDonald, U. S. Navy, in 1910, and as I have since run across a great many officers who have never heard of it, including many navigators, I will describe the method briefly:

Invert the sextant, holding the handle of same, in left hand. Look through telescope, or telescope holder, and through horizon glass, in usual manner, at the *star*, and not at the *horizon*. With the index arm at zero, swing it around slowly until the reflected image of the *horizon* is brought up to the *star*. Clamp the index arm, and, turning sextant over, observe the star in usual manner for altitude.

The simplicity of this method lies in the fact that it is easier to keep the eye on the reflected image of the horizon than on the reflected image of the star, in carrying one to the other.

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SPENDING THE SECOND DOG WITH THE *FLYING DUTCHMAN*

By Pay Director J. A. Mudd, U. S. Navy

The packet of old letters I received from home shortly after going to sea as a midshipman was a singular one, and it is likely you could not guess in a thousand trials what made it so. The letters indicated a warm friendship between a member of my immediate family and a cousin in the navy. They covered a period from a few years prior to a young lieutenant's stay on the African coast in the early "forties" of the last century to our Civil War, when it was then a correspondence between the commander of a Mississippi River gun-boat and a colonel of cavalry in the Union army. There a Confederate bullet ended it; and, later, the time came to pass the relics on to me.

This though is not going to be a story of war; no, not even at a time when the world is carving its cheese with a sabre and drinking its coffee from an empty cartridge shell. How can one enjoy writing a story about such a thing? Just as he begins to kindle his pages into a conflagration, with annals of glorious glory, bravery unadulterated, extreme recklessness for the sake of the traditions of the service, he drowns out this sacred fire in a deluge of tears for the pity of it, for its horrors, for its sufferings, for its bottomless anguish, for grief for the thousands of dead young hands that never again will clasp en camaraderie. Glory is almost the pinnacle for sailor or soldier, but not quite: above all the pomp and circumstance of war rises the human heart of love, and now it speaks but one word upon the earth, over and over, "Weep, weep, weep, ..."

Yes, in the real sailor or soldier, glory can never drive the love of fellow-man down to second place, the assertions of the ignorant, the unthinking or the malicious notwithstanding. Look

back upon that sunshiny morning of death in the North Sea recently when three great unfortunate fighting ships carried most of their crews with them to the bottom. Love was busy there. Those captains when they rushed to one another's assistance knew *all* the danger of it to themselves; but they had ceased to be skilful fighters—they were simply brave brothers. The young hero who sent them to the bottom, what of him? After two had been fixed, he stood there at the periscope hesitating. No, he would not blow up the third and last, busy dragging the other two crews from the water. He hesitated, until a wise voice at his side whispered, "Remember, sir, we are fighting four navies."

What word could be appropriately stamped on fully half the Victoria Crosses that Britain has bestowed upon her super-brave sailors and soldiers? *Love!* The impulse of chivalrous recklessness to save a fellow-man's life at great risk of losing one's own cannot come from the devil. The spirit of cool calculation that spends the live-long day watching the worldly scales in which we weigh the issues of life may come from that source—often does. Some cusses who wear the cross for saving life in battle might not be selected under theological or even ecclesiastical formulæ to pose for a picture styled "brotherly love"; nevertheless, I believe they truly hold a pass for the gates of paradise, no matter what other kinds of countersigns may be accepted.

Come with me into a stranger scene than even war, if I am to tell this story in a straightforward manner, without embellishment. And I shall, in starting, give you some essential points from two or three of the old letters. That brig-of-war upon which the lieutenant was serving on the African coast must have been twisted inside and out. Nothing like her could have had such sordid and disastrous adventures without having more than one screw or bolt loose. I am not going to tell the whole unfortunate history of the ship: go to the archives of the government for that. In fact, the few words I shall have to say might almost be summed up under the heading of unwritten history. The letters in the package that are of most use to me now are two, one closely following the other as to date. I am not going to say a word about the letters that tell of fighting the savages in the South Sea islands or those that give such a thrilling narrative of trying times with Wilkes in the Antarctic. I never read in history or story book such wonderfully interesting tales as these,

but it would be entirely out of place to bring any part of them in here, for the simple reason that they are other stories.

The two letters just mentioned tell of the strangest happenings that could well befall a sea craft, even one all awry. The fact is, whether you find it in the records or not (for is it not here in faded black on the browned white paper of these old missives?): our navy relative had seen the *Flying Dutchman; three times he had seen it.* Space will not allow all details that are found in the old letters; and it is far better that I summarize in a few cold words the hair-lifting description, instead of trying to choose between the different parts of the narrative, each one of which would make a wooden Indian sit down and listen in wonderment.

The brig was on its way back to the cruising grounds from a run south. At first they took the thing they sighted to be a large slaver. When it disappeared slap bang behind one of those sudden, furious squalls that in those seas have stripped many a ship to its deck, they wondered about her—whether she had gone to Davy Jones' locker or had been blown away over the horizon dismasted. But right then the sailing master, shaking like an aspen leaf, said, "Did you notice that, with all sail fulling, she was holding a course directly into the eye of the wind?" Well, the others hadn't noticed much of anything: it had all been so sudden and short. But the doctor kept an eye on the sailing master.

Two days after, if that strange sail had during the time elapsed kept her old course (according to the sailing master), it and the brig were many leagues apart. The lightning that night, with no apparent reason, claimed the stage—until close aboard, from out the velvet curtain of black, went sailing by, with everything drawing alow and aloft, right in the eye of the wind, a huge craft, on board of which was never a light, and silence as profound as death. And our lieutenant, standing near the old sailing master, heard a gurgle in his neighbor's throat as a vivid bolt of lightning seemed to pierce the high, strange barque as it vanished under the cloak of night. You seamen of to-day may think that after that there was joking bravado and, perhaps, a glass of rum. Not at all. Every one on the brig was ill at ease and in a bad humor. The sailing master went down with the fever. Perhaps it was coming to him anyway, from that trip up an African river

to fill the water casks, but he went down with it at that time just the same, and he told the doctor that it was all up with the brig—that that was what the *Flying Dutchman* always meant.

Then a week later, when stout hearts began to buttress themselves to normal again, far over towards the horizon, as if beckoning the brig onwards to the windward countries of nowhere, came out of nothing that huge sterned ship, sailing, with a rush, directly into a gentle breeze—so it seemed. The lieutenant again had the watch, and as he got a spy glass well on the craft, out of the locker of storms came one of those frightful gushes that seemed to slap the strange thing off the face of the ocean, but never touched the brig. The lieutenant wrote that he had just time to make out that half the line of stern cabin windows seemed shot away, that he could almost see into the cabin. Now please do not think that those fellows on the man-of-war were a crowd of softies and rum dreamers, for you will be wrong. It was simply this: they had seen the *Flying Dutchman* and they knew it. Sailors even of to-day will be charitable, I imagine. If any gallant soldier should happen to read this account, and if through his brave system a feeling of disdain should creep, let me say now to him that I am certain the sailing master of that brig would have cheerfully knelt in the front rank of a hollow square to meet the fanatical charge of a horde of fuzzy wuzzies rather than to have been at sea at that time. And the good, plain citizens on shore, with doors barred and locked in the evenings and a snug, loaded musket in the hall corner, might call the whole thing a fairy story. But they of the brig had to take it seriously. Did not the purser propose they make, from the dollars in his strong chest, a solid silver shot for the bow chaser, so as to send it to the bottom the next time they saw it? That officer told of when his great uncle took an English squadron round the Cape in the last century and had each ship carry a silver shot for that very purpose, to rid the seas of the *Flying Dutchman*. And indeed they did meet it, those Englishmen; and the frigate *Splice,* the furthest to windward, let go her magic cannon ball at once, but it was a bungling, nervous job and they only smashed off a part of the stern, into what seemed like a thousand sizzling sky rockets. It is quite true that the captain of the *Splice* immediately fired a broadside; but what could 24 common iron balls do? Nothing. And a moment after the ship had disappeared, as was its wont.

So fell the curse on that yankee brig-of-war. It would be well not to pooh-pooh this idea. You wouldn't, it is quite certain, if you could have sighted her one day, on her homeward voyage; such a day, off there in the broad Atlantic, that even made Father Time cut a deep notch in his scythe handle. Yes, if not close aboard, you could with a good glass have seen dangling from her yard-arms three strange looking bundles, that swung back and forth in a clumpy way. And, then, if you had more curiosity, you could have borne down on the brig and soon made out behind each one of those gruesome bundles a pair of still hands, lashed so cruelly together with strong cord at the wrists, and under each, a pair of feet, bound stoutly together at the ankles. Phew! it is too much, and I am not surprised to see you go about and get away from that ship, she who had been cursed by the *Flying Dutchman.* But as you so maneuver, if you have not shut your ears as well as your eyes, you will hear the clank of many chains, chains that hang from live human limbs bolted to the spar deck—they of the brig's mutineers whose necks were not broken that pretty morning with the pull-away of a toggle on the end of a tripping line, they who had escaped a capstanhead trial for the safer haven of a shore court.

Will you now be willing to admit that that poor brig had drunk to the very dregs of calamity? Bah! if there could be any fun in this story I would bring it in right here. If I could appropriately sing of spring time and babbling brooks and flowers, I would do it now; but it cannot be. This tale must remain the oppressive, depressing, awful yarn that it is; no use trying to varnish it over for sensitive souls: the fire beneath would sizzle the varnish off in a second of time. But I will do this much, I will not follow the brig in its career of continual calamity thereafter: only to say, that several years later, when the Mexican War was on, it saw its chance and took it. While under full sail in the Gulf, an unusual gust knocked it down so far that it never righted. The truth is that it did not want to right; it was too tired of the whole mournful business. So down it went to the bottom of the sea that breezy morning, and down at the bottom of the sea it rests now, a mass of rotten, devil-cursed timbers.

The mail that brought me the stirring old letters, we got at sea by overhauling a Pacific Mail liner for our bag, a great dodge of our captain's; and that same red hot day I spent most of the

time absorbing their contents, and Marryat was not more interesting. But at last they had to be put away for supper and watch. I had the second dog as deck officer, a wet-nursed one; the midshipmen were not allowed to have the deck any later than that. We were steaming; an unusual thing for us, because most of the time our two funnels were telescoped down out of sight, to make room for setting the mainsail and the staysails, and our propeller would be uncoupled. The steady job of the engineers was polishing brightwork, and the engine was fit to be placed in pink cotton; we forgot sometimes it was in the ship. In those long ago days, on account of small appropriations and stringent regulations on the subject, the coal in the bunkers was about as precious as the money in the purser's safe.

After supper all hands, as usual, were piped to skylark, and boisterous noise held sway for a while. Then as the gloaming deepened, tired chaps dropped around in groups on the deck, under the high bulwarks, and things began to march on towards the quietness that precedes the eight bells at sea that usher in the first watch. I paced up and down the poop, where we stood our watch both sailing and steaming. So went on that eventful second dog to its climax, while crossing the Gulf of ———— (memory fails me for the name) on the west coast of Central America. I had remarked to Olsen, the quartermaster, upon coming on deck that we were playing in luck to have this mill-pond to steam through that night, as that particular gulf was noted for its rough waters, and we had had a dose of them the last time we went north. Olsen looked around and allowed that the lightning was *strangely* incessant, but perhaps that didn't mean anything—the glass was high.

There wasn't much to do and I fell to thinking of those letters, my mind going off to the African coast and back to when a certain brig-of-war was there and its sailing master shook like an aspen leaf—he who went down with the fever afterwards. Six bells had now gone some time when, glancing directly to starboard, my breath was forced back into my lungs until I choked and my eyeballs pulled at their moorings so that I thought they would carry my brains away. Slipping by me there in the gloaming, with never a swish or a light, at right angles to our course, was a huge vessel with her stern towards us. A second sooner and we must have cut her in two; so close, so close was she that

I could have tossed my trumpet up on her high after castle. Her sails were bellied out as if from a gracious wind, although there was not a particle of air stirring over that flat sea. I could not hail—I had lost my voice—and just as I reached out to grab for a support, a wild flash of lightning came down directly over this strange barque and shot into her main hatch and then out of her huge flat stern into the sea between us; the next moment the ship vanished. But this is nothing to what I saw in the cabin. In the glare of that fiendish lightning, I noticed a great hole there, as if half the stern windows had been shot away. Through that hole the cabin was lighted up for the moment with a glow resembling the white heat light of the inside of a furnace. There at the cabin table I saw two—no, I cannot truthfully say two humans; but the *man* who sat or crouched at one side was dressed in such a strange garb of laces and velvet that I knew him to be no skipper of any wind-jammer of our day. As for the other—ough! I made up my mind then and I have the same mind to this day, not to talk about the scene at the cabin table.

I turned, and there stood Olsen. "Olsen, did you see that ship?" I whispered. "What ship?" replied he, looking amazed. "That one we came near cutting down just this minute and the lightning went right through, out at the stern," I answered. "No, sir," said Olsen, looking at me seriously, "I saw lightning just now but no ship." "Well, Olsen," I laughed, or tried to, "I must be seeing things," and I had to let it go at that.

You may think all this somewhat strange, but hear about what came after. We were going about nine knots. It must have been nearly a half hour from our first sliding by the *Flying Dutchman*, and Olsen was again fooling around up on the poop. Relief by the first-watchers was not far away, and I tell you I was good and ready for it; I wanted to close my eyes off in a quiet corner and try to think it all out, as I was beginning to be worried about myself. I was continually looking off to starboard in the darkness, and every time there was a flash of that unaccountable lightning I would wince. Then came the moment out there: gliding by in the night, close aboard, was that great square stern *again* and those dirty, bellying sails and—I think I would have fallen to the deck had not right across my shoulder come the hoarse, thundering hail of that Norseman Olsen, "Ship Ahoy!" followed by a blinding flash of lightning. I closed my eyes but a

second—then it was gone, with never an answering hail. I grabbed Olsen by the arm to hold on to and yelled at him, "You saw it, didn't you?" "Indeed I did, sir, *this time,*" he replied, "and a narrow squeak of it that fellow had. An old Dutchman saving oil, that's what it was, sir." The quartermaster's cry had produced some excitement, and the captain wanted to know what in the world we had seen, and the catheads were told to keep a sharper lookout; then things quieted down, with no mention of my first sighting of the—yes, indeed, a Dutchman, but Olsen little dreamt of the kind. He was uneasy, though, for presently he sidled up and said, "That was queer business, sir, but I certainly did not see the first ship." I replied, "Olsen, let's forget all about the first ship; but didn't you see the lightning go into the second ship and out at its stern?" He acted extremely puzzled at this and answered that there was a bright flash just as we passed the craft but that it seemed to him off ahead of it. I added, and with some feeling, "Did you not notice anything the matter with its stern?" Again he seemed troubled at my attitude and replied that as we had passed it so quickly he had had no time to see much of anything. So I had to rest it there. The last few minutes of the watch became an ordeal: I felt the curse was on our ship and I wondered when it would become active. Then in the absolute stillness, except for the chunketty throb of the engine, as I was gazing timidly off to starboard, there came *out of the sea,* a little forward of where I stood, the most awful shriek a man could well listen to. It was unearthly; more the cry of some wriggling titanic demon, as it shot out from the water directly at me. We were certainly down on the *Flying Dutchman* again, but which one of those two—which one was overboard in the sea? Had the chevalier in velvet and laces gained a moment's courage to drive the dice box into those piercing eyes opposite and hurl the massive, slippery *thing* through the hole, into the ocean? Or had he, with the beads of hot sweat rolling down his furrowed cheeks, made a break for liberty from their eternal, infernal game, and jumped into the water himself?

As my thoughts crowded into but a second of time, out shot the cry fore and aft, "MAN OVERBOARD!" The deck lieutenant relieved me instantly, and I had just sense enough left to climb into and take charge of the life boat being cleared away close at hand. Way off astern blinked the port fire of the life buoy,

and to that the boat's crew pulled with all their might and main. I knew it was useless, as there was no man overboard from us—that is, there was no ordinary human man in the sea that night. Who knew better than I whence had come that despairing cry? As we seemed to lose our ship in the darkness I felt far from easy. But we reached the buoy, and, of course, no one was clinging to it. We began an ever evolving circling of the buoy, with the boat's crew hollering themselves hoarse; but out of the night came back nothing but silence profound. Then in a moment, right close by, flashed out a jingle of colored lights. Ah, that cursed ship was on us, and would indeed have us! Then there sounded in my port ear, as if from far away, the voice of the coxswain, a great fellow braced there with a big straddle, with his huge paws grasping the long steering oar, saying, "That's our recall, sir." Strange night, strange happenings, our innocent recall to give me such shivers. I was glad to start back and I hurried the lads to get the life buoy in the boat, jumping to the bow myself and helping to haul the heavy metal thing on board. That sizzling port fire on it would not be put out and it stunk one's senses almost away. At last I got a boat stretcher and knocked it squirting and sputtering into the sea, with the little iron pan in which it burned, and it disappeared like the tail of that lightning that shot out of the hole in the stern of that hellish cabin. Thank goodness, the crew pulled back with a will, although they were wondering who it was that had been lost, not knowing, poor fellows, what a close call they were having to being picked up by the *Flying Dutchman.*

When we got back, there was a curious story to tell us. A man, washing a piece or two of clothing out of the regulation time, had tried to hang the articles, to dry in the night, outside the ship; and the laniards of the lower shutter of a gun port on which he stood gave way and dropped him into the sea. He managed to hold on to the end of a piece of running rigging he was using for clothes line, and then before the ship had dragged him tired, and as it slowed down fast, he scrambled to a hold on some of the iron fittings on the outside of the ship. When the ship stopped, and we were well away in the life boat, they pulled him on board again. They said it was he that had screamed. Well, it may be so, but Olsen certainly saw the *Flying Dutchman* the second time: that is a matter of history, and it can be read to-day in the ship's

log of that day, although it was simply put down as a ship that had passed in the night showing no lights. I was in no humor to be assertive or to talk at all about the thing. To this day I have never told what I really saw going on at that cabin table—what I saw through that ragged hole in the stern, and I do not intend to tell it now. I was only too glad to escape the *Flying Dutchman* when we courted destruction in the whale boat, and I have always thought it behooved me to keep certain details entirely to myself; it has been hard enough to tell what I have in this narrative. If you think you are able to draw a line between what men call the natural and the supernatural, just let it go at that, without any bravadoistic mess of words.

I liked Olsen, but I was glad when soon after he was transferred to the flagship to go home and be paid off; he would be looking at me so queerly many times when he thought I was not noticing.

It may be wise for those who read this tale not to class it with fabulous narrative. No doubt, in the opinion of some, I could strengthen myself against the incredulous by inviting attention to an occasion a hundred years ago, in our 1812 war, on which the Yankee privateer *Neptune's Lady* and her audacious captain figured. Is it not all a matter of record? When the privateer sighted the *Flying Dutchman* the audacious captain laid a course to ram her. He laughed at the timid ones and talked a lot about mirage and such delusion and fooling. And *right through it* he went without the sound of even a splinter, exactly like you might walk through a ghost in your own house on shore at midnight. But the minute after, every stitch of canvas that was bent on the privateer dropped from the yards in charred shreds and every fathom of running rigging became as punk, although nothing had been on fire. And the captain of the privateer was mysteriously missing that night and has been missing ever since. I ask you again, is this not all a matter of record?

Now I shall surprise you when I say I do not believe that story of the privateer, record or no record, sails and running rigging or no sails and running rigging. In the first place I know it was not the kind of *Flying Dutchman* I saw and Olsen hailed that night. If anyone had tried to sail through that one I am certain that at least his bow paint would have been scratched off and his head booms turned into kindling wood. In the second place, there

is but *one Flying Dutchman,* everybody knows that—the one that can be sunk by a solid silver cannon ball; and how could that phantom of the privateer's be sunk by anything? As for the punked rigging and the charred sails, tell that to the sea gulls!

Some purists may challenge my statement of seeing the *Flying Dutchman* in the northern Pacific, affirming that it never could get away from trying to double Good Hope. If so, I would ask them, "Has not the *Flying Dutchman* been seen dozens and dozens of times in the German Ocean, that is, the North Sea? Are not marine annals full of such appearances? Well, then, if the North Sea, why not the coast of Central America?

We were not bothered again by the *Flying Dutchman.* We were really not the ship; and it must have been gunning for some other in those seas when I saw it, very probably our flagship. Our captain, although not standing out distinctly as a rallying point around which a church might be built, was a Christian gentleman according to common sense rating. There was no chaplain on board, but every Sunday the faithful and the hopeful and the fearful gathered on the berth deck around the captain and the ship's bugler, and then the skipper read the morning service and led the singing with a voice like a fog horn. And in the evening of the same day our navigator, an exceedingly acceptable gentleman, led song service, much to the disgust of several old infidels in the wardroom and a steerage full of young pagans. But the steady hand of faith controlled the ship, and that saved it from the—well, from what I saw through the shot-away stern of the *Flying Dutchman,* from what stood on the other side of the table from the man.

It may be that the *Flying Dutchman* no longer sails the seas. Who can tell? The game may be over. Things come and things pass in this evolving world that no one understands much about. Only yesterday the now extinct rhytina flourished in our sea world, and yet I wager if you saw a herd of them come flopping up out of the water, with their see-saw jaws open, you would be as much astonished as if you saw the *Flying Dutchman.* You could not *now,* no one could have one, no matter how much he might wish it. Yet once upon a time those rhytina were here, perhaps enough for each one of us to have one, if we cared to. Then why should the rhytina go? you ask. Ah, that's the point, and you might as well ask the *Flying Dutchman* as ask me.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

CHEMISTRY OF PRIMARY GALVANIC CELLS AND GENERAL DISCUSSION OF STORAGE CELLS

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Before studying the chemical phenomena of a galvanic cell, it is well to have a clear idea of the combinations which can take place in the molecular structure of the electrodes and electrolyte. This, at first, would seem to be no more than is covered by a simple chemical formula for the union of molecules according to the atomic theory, but when we get down to it, we find many queer things take place on the passage of an electric current in a cell, and questions naturally arise which cannot be answered while holding strictly to the purely chemical laws of reaction. So various theories have been introduced to account for the phenomena which are discovered in electric cells.

By these theories we can account for the manner in which the current is borne across the electrolyte, why certain liquids make better electrolytes than others, what metals will be most economical, etc.

A primary or voltaic cell is a machine for converting chemical into electric energy.

An electric battery is a combination of cells arranged as circumstances require to produce a higher electromotive force or a greater intensity of current. The simplest form of cell consists of strips of zinc and copper dipping into dilute sulphuric acid, but there are many types which still survive from the hundreds that arose from Volta's and Galvannis's great discoveries in the beginning of the last century. These types may be classified as "wet," "dry" and "standard," the latter being used only as standards for comparison. The wet cells of greatest importance or interest are the Daniell, Grove, Bunsen, Clark and Le Clanche; and we will take these up in the order named.

But before taking up the details of the special types of cells, it might be well to say a few things and review a few definitions that continually recur in all the ideas of electrochemistry.

An element is a substance which cannot be reduced by any known chemical analysis to a simpler substance; and an atom is the smallest mass of an element that can enter into chemical combination with another element, or itself. The atomic weight of an element is a number which is proportional to the smallest known combining mass of that element, and when the atomic weight of oxygen is arbitrarily chosen as 16, or that of hydrogen is taken as 1, the atomic weights of all elements are approximately simple multiples of these numbers, and on the atomic theory the atomic weight is proportional to the mass of the atom.

A molecule is the smallest mass of a substance that can exist and preserve its chemical properties, and hence the molecular weight is the sum of the atomic weights of the atoms which combined form a molecule of the substance considered.

The valency of a chemical substance such as an acid, or an acid radical (by which we mean the part of acid other than hydrogen), is the number representing the number of replaceable hydrogen atoms which the acid molecule contains, the valency of the hydrogen atom being always taken as unity. Thus HCl is univalent; H_2SO_4 is a bivalent acid and the radical SO_4 is a bivalent radical. In nitric acid NO_3 is univalent. PO_4 in phosphoric acid is trivalent since it combines with three atoms of hydrogen. In a salt, the metal part may be of one valence while the basic radical may be of another. For instance, NaCl is uni-univalent, by which we mean each part of the molecule is replaceable by or replaces one atom of hydrogen in the corresponding acid. $BaCl_2$ is a bi-univalent salt, since Ba replaces two atoms of hydrogen, while on the other hand $BaSO_4$ is bi-bivalent, since the basic constituent is bivalent as is also the acid constituent.

Some metals are univalent in some compounds, as copper in cuprous chloride, CuCl, and bivalent in others, as copper in cupric chloride, $CuCl_2$.

Valency is made use of in determining the chemical equivalent or equivalent weight of a substance, and is important because electro-chemist's quantity of electricity, 96,540 coulombs, to pass weight. For instance, if we know that a certain amount of copper is deposited by a current passing through an electrolyte of CuCl,

what amount of copper would be deposited in the same time by that current passing through $CuSO_4$? Now the equivalent weight of an acid, base or salt is its molecular formula weight divided by the highest valency of either of its ions. So if we allow the electro-chemist's quantity of electricity, 96,540 coulombs, to pass through CuCl, it will deposit a number of grams called the gram equivalent, always the same in amount, unaffected by voltage or rate, and which can be calculated for any substance.

An ion is one of the two parts of a molecule of some chemical compound. One ion is capable of being positively charged and will, therefore, tend to unite with another ion which is negatively charged. The negative ion which tends to move toward and unite with a positive one is called a cation because it tends in the positive direction of flow toward the cathode. At the surface of the immersed cathode the little cations are swarming and waiting for a chance to marry the negative parts of molecules set free by electrolysis. Faraday gave these ideas to the world in 1834, and they still hold as plausible as any. To complete the picture we have the anions or ions of negative charge drawing toward the anode, or in the negative direction, and clustering at that pole. We will see that H_2SO_4 breaks up into its hydrogen cations denoted by $H+$ and anions SO_4--.

When the current begins to flow the $H+$ gathers on the cathode to unite with whatever negative metallic ions are there exposed, or simply hangs on as bubbles of gas. Since the anion and cation cannot always be given off as gases, we must investigate what might take place. The cation $H+$ meets the oppositely charged ion from the cathode, which in the case of discharge of a storage battery PbO_2 plate is the PbO_2-- ion, as suggested by the noted authority Liebenow. The peroxide ion which chemically is insoluble in sulphuric is supposed to now change into a $Pb++$ ion and H_2O. The $Pb++$ meets SO_4--, which we saw was an anion coming directly to the anode, to precipitate immediately as $PbSO_4$. The anion SO_4-- always moves in a negative direction or towards the anode. That electrode is probably reversible with respect to $Pb++$ ion and the lead goes into solution as $++$ ions in proportion to the amount of current although this cannot be chemically shown. It doesn't get far, as the SO_4-- ion is moving toward it and practically drops it in its tracks as $PbSO_4$. The only thing left over from this reaction is

the H+ which was born when the H_2SO_4 was dissociated into its ions + and — to furnish the SO_4 — — ion and the H+ ion. The H+ then carries current through the electrolyte toward the other plate, the cathode, and completes the balance to make the theory plausible.

The exchange or secondary reaction at the plate we have just seen permits the large current in a secondary cell without the corresponding ionic concentrations of the electrolyte which we find in galvanic cells, and forms the chief difference, that of reversibility without the formation of "tree deposits" on the plates.

Every salt or acid solution contains ions of opposite polarity in each of its molecules; thus KOH is composed of K+ and OH —, while $CuSO_4$, as in a Daniell's cell, is composed of Cu++ and SO_4 — —. All basic salts contain the hydroxyl ion, OH, and a metal ion. All acids contain the hydrogen ion, H+, and the other ion, such as NO_3 — or SO_4 — —. Solutions of metallic salts contain the metallic ion, such as Ag+, Al+++, Zn++, and the ion formed from the other part of the salt such as Cl—, ClO_4 —, SO_4 — —. We notice that hydrogen or a metallic ion is always + while the other is —, so we can always expect the former to attack the cathode, the latter the anode. But why do we denote some by the double or even a triple direction sign? That is to show their capacity for carrying the current and is in direct accordance with their chemical valence in uniting to form chemical compounds. The amount of electricity carried in one direction compared to the other depends on the carrying capacity and migration velocity of the respective ions, as we shall see. For the passage of a given amount of electricity, a definite weight of metal is chemically acted on, no matter what kind of metal it may be, and this weight for the electrochemical unit of quantity will be the gram equivalent of that metal or its equivalent weight expressed in gram units, as we have seen, and which can be experimentally proved. The passage of 96,540 coulombs, the unit of current we speak of, will use up a gram equivalent of any metal. Since the ions may be divalent, trivalent, or even quadrivalent, it is seen that some must move faster than others and will give rise to different ionic densities which we find to be perfectly true by use of a coloring matter in the form of a chemical indicator. Hydrogen ions have been found to move faster than any others

and five times as fast as the SO_4 ions. That is why the acid concentration in a lead sulphuric cell is so much less near the anode than at the cathode.

If we bear the above ideas in mind, we can understand why it is that the chemical properties of our plates in a lead storage cell can be acted on by an acid which without current is practically inert in respect to the electrodes.

Faraday's law stating the relation between current quantity and weight of the electrodes acted on covers the case of polarization, which is the formation of gas bubbles on the electrodes to hinder the passing current both by increase of resistance and a counter-contact potential. No cell if free to polarize will have any kind of an E. M. F. after a few minutes, but if the bubbles can be kept off by any means the terminal E. M. F. on closed circuit will depend practically on the internal resistance of the electrolyte and the contact potential differences of the electrolyte and the two electrodes. It was polarization that necessitated the attempts resulting in the various cells now to be described.

If instead of dilute sulphuric acid as an electrolyte we dip each electrode into a salt of the respective electrode's metal, then metal instead of gas will be deposited. The Daniell cell is one on this principle. It consists of a copper cathode and zinc anode, dipping into copper sulphate and zinc sulphate respectively. One type, used extensively for railroad telegraph work, is the Gravity Daniell, known popularly as the Crowfoot battery on account of the shape of the zinc electrode as it was made. $CuSO_4$ being quite a bit heavier than $ZnSO_4$, was put in the bottom, crystals of the salt being packed around the copper plate. The anode zinc was hung in the $ZnSO_4$, which liquid floated on top of the saturated solution of copper sulphate.

When the circuit of the Daniell cell is closed, zinc goes into solution, slightly increasing its specific gravity. The current entering at the anode breaks up the electrolyte into its ions and also ionifies the molecules of the zinc plate. Those of positive sign $Zn++$ start out for the cathode, but as soon as they enter the electrolyte they are met by the electrolytic anions $SO_4{--}$, which neutralize them to make ordinary molecules in the electrolyte. The SO_4 ion is supposed to pass right through the dividing surface of the $CuSO_4$ and $ZnSO_4$. The cation of the copper sulphate solution is deposited as metallic copper on the copper plate.

The formula for the chemical reaction may be represented by

$$Zn + CuSO_4 = ZnSO_4 + Cu;$$

or completely,

$$Zn + ZnSO_4 + CuSO_4 = 2\ ZnSO_4 + Cu.$$

The zinc sulphate is replaced by dilute sulphuric acid in some types of Daniell's and has been found to work as well. The ordinary type with porous separator for the two electrolytes does not require to be kept so free from disturbance such as jarring or vibration, as the liquids will not mix except by osmotic pressure. This is appreciable on open circuit, and it is often arranged to have a high resistance thrown in so that a slight current will always flow.

The porous cup type must be taken apart when not in use, on account of wasting away of the zinc and deposit of metallic copper in the pores of the porous cup where zinc touches it. Amalgamating the zinc and covering with paraffin those portions of the cup which may come into contact with the zinc reduce these difficulties.

The resistance of a Daniell cell, like that of most liquids, diminishes with increase of temperature, but is approximately 0.3 ohms. The E. M. F. is about 1.1 volts.

The Bunsen cell, which was so much used to produce current for storing in accumulators before the modern generator was known, is simply a modification of the Daniell cell. Sulphuric and zinc are used as in the Daniell, but copper is replaced by carbon, and copper sulphate by strong nitric acid, which acts as a depolarizer in a chemical way. The H+ ions, freed from SO_4 — —, and moving toward the carbon cathode, give up their charge through a secondary reaction which evolves an oxide of nitrogen, both unhealthy and unpleasant. The E. M. F. is 1.97 volts and the low resistance enables large currents to be drawn. The chemical reaction is

$$Zn + H_2SO_4 + 2HNO_3 = ZnSO_4 + 2H_2O + 2NO_2.$$

The Grove cell is similar except that the positive pole is platinum in strong nitric, while as in the Bunsen and Daniell the negative or anode is zinc and sulphuric.

It requires less nitric acid and has a slightly greater E. M. F., but is much more expensive on account of the platinum electrode. The chemical action is the same, no action taking place in the metal of the cathode.

The Le Clanche cell—so important for intermittent work on account of its great recovering properties and cheapness—is of quite a different character. It consists of an electrolyte of NH_4Cl (ammonium chloride or sal ammoniac), zinc anode and carbon cathode. The polarization consisting of hydrogen bubbles, on the carbon electrode is reduced by blocks of compressed MnO_2 (manganese dioxide), which combines easily with the nascent oxygen. The characteristic equation is

$$Zn + 2MnO_2 + 2NH_4Cl = Mn_2O_3 + H_2O + 2NH_3 + ZnCl_2.$$

The sal ammoniac attacks the zinc to make zinc chloride, while the electrolyte, breaking up into oxygen, zinc chloride and ammonia, is taken care of by the depolarizer, so that although oxygen bubbles form to choke the useful E. M. F. on closed circuit, they are rapidly absorbed when the circuit is opened, and the cell soon recovers its original E. M. F. of 1.5 volts.

The dry cell has continually increased in use until now there are over ten million made each year in the United States alone. The chief difference between dry and Le Clanche cells lies in the electrolyte, which is sal ammoniac absorbed in pulp board, starch paste, or some similar absorbent, so the electrolyte will not spill. The anode is a zinc can serving also as container, the standard size being a cylinder 2.5 x 6 inches.

The positive pole is a carbon rod. The absorbent layer above mentioned is placed next the zinc and is saturated with a solution of sal ammoniac and zinc chloride, the latter being necessary to prevent undue deterioration on open circuit. The dioxide depolarizer, as in the Le Clanche cell, is packed around the cathode, while the top of the cell is sealed with a waterproof pitch. The E. M. F. is between 1.5 and 1.6 volts, while the internal resistance varies from 0.1 ohm in a high grade cell to 0.5 ohm within 9 or 12 months, and the average short circuit current (with external resistance not over 0.1 ohm) may be looked for from 18 to 25 amperes. The shelf-life, or length of time the cell can stand on open circuit before the available external short circuit current reduces to half its original value or about 10 amperes, is generally 8 to 10 months, but some of the cheaper makes will last only one or two months. The Clark Standard cell is made to give a very steady E. M. F. for comparison and measuring, and consists essentially of negative plate of mercury, a paste electrolyte of

$HgSO_4$ with a Zn positive in a saturated solution of $ZnSO_4$. All parts are chemically pure, and variations are eliminated wherever possible, even to soldering the terminal wires to the electrodes. The action is the decomposition of the mercurious sulphate, adding the mercury released to that already forming the cathode, while the anode is acted on by the zinc sulphate losing its equivalent weight of pure zinc.

The following tabular summary gives the salient features of the most important primary cells:

TYPICAL WET BATTERIES

	Porous cup Daniell	Gravity Daniell	Bunsen	Chromic Acid	Edison Lalande	Le Clanche
Positive pole..	Cu	Cu†	C	C	C	C
Negative " ..	Zn*	Zn*	Zn*	Zn*	Zn*	Zn
Electrolyte.....	H_2SO_4 or $ZnSO_4$	$ZnSO_4$ or $MgSO_4$	H_2SO_4	H_2SO_4 or NaCl	KOH or NaOH	MnO_2
Depolarizer....	$CuSO_4$	$CuSO_4$	HNO_3	CrO_3	CuO	NH_4Cl
Separator.....	Porous pot	None	Porous pot	With or without pot	None	With or without pot
E. M. F. volts..	1.07 to 1.14	1	1.9 to 1.95	2	0.75	1.5
Resistance, (ohms)..	0.3 to 30	0.1 to 6	Low	0.5 to 4	0.02 to 0.1	1 to 5

* Amalgamated
† In Kruger cell copper-plated lead is used.

Coming now to the storage cell, which commercially and practically is of greater importance than the primary, it is seen to differ from the latter chiefly in its propensity for reversals. When it is discharged it may be restored to its original condition by passage of current in the opposite direction. Although a Frenchman named Gautherot discovered the principal of storage cells in 1801, the first accumulator, as the storage or secondary cell is often called, was made of practical value by Gaston Plante in 1860. He used lead plates and sulphuric acid, just as we do now, and found that by repeated charges and discharges between two immersed lead plates he finally and gradually increased their power of absorbing energy.

Capacity to store electrical energy, as so often thought of, is really a misnomer, for the real process is a chemical transformation, a reversible cycle. When lead plates are immersed in dilute sulphuric acid and a current is passed from one plate to another,

the electrolysis sets free hydrogen ions on the anode, which travel to the cathode to combine with free oxygen ions set free at that electrode. Thus the cathode is reduced while the anode is oxidized. So, after several charges and discharges, the chemical properties of Plante's cell were changed and it was found after several cycles that one plate would become covered with lead peroxide, PbO_2, after a long charge, and the other remained pure lead. Then the plates had different values on the electrochemical scale. The lead peroxide being positive to the pure lead, could act as the positive of a primary cell, and by the action of the electrolyte on the two elements, a current was available in the opposite direction to the charging current. This current reduced the plates to their original condition. The chemical reaction of this cell is expressed

$$PbO_2 + 2H_2SO_4 + Pb = PbSO_4 + 2H_2O + PbSO_4,$$

which reading to the right represented discharge or to the left charge. Plante's original cell gave but little capacity, due to its small plate area, and the fact that the oxidation could penetrate the smooth lead plates to no considerable depth.

Nowadays, the cells fashioned after the Plante type have plates whose sides are scored or gouged into ridges and thin leaves so that there is a great amount of surface exposed to the chemical action taking place.

Another French scientist, Camille Faure, decided that he could obtain better results and skip the long forming process by employing a porous paste of lead oxide for the positive plate and a soft porous lead plate for the negative. When immersed in sulphuric these plates are already capable of producing a current, and the chemical action is

$$PbO_2 + 2H_2SO_4 + Pb = PbSO_4 + 2H_2O + PbSO_4;$$

both plates then being covered with a coating of $PbSO_4$, lead sulphate. When this state is reached, the plates must be recharged.

The commercial storage cells of to-day are still fashioned on these principles, but a modification of Faure's discovery is also used, combining Plante with Faure plates.

Most of the hard battery service in the commercial world has been done by Plante batteries, and these are largely used for regulating service in electric power plants. In these Plante batteries are none of the original elementary lead plates used by the inventor, but plates formed into positives and negatives by an

electrolytic process instead of mechanical, as in the Faure type. The Plante batteries are characterized by their extreme immunity to abuse and ability to deliver current at high rates with good efficiency when maximum capacity for limited weight and space are not essential.

Instead of the laborious process of coating a smooth lead plate with lead peroxide by electrolysis, the present formation consists of scoring, grooving, laminating, casting or pressing the lead plates so that a very large surface is available to the action of the current. The process known as scoring, for instance, consists in passing the plate between rollers which are run in gauges and fitted with closely spaced discs which cut or press into the soft lead on each side of the plate, and press it out into thin ribs or leaves between the wheel tracks so that the surface, when finished, looks like the under side of a mushroom and is 20 times the original area. This is one method used by a well-known firm, the Gould Storage Battery Company. Another survivor of the thousand and one patented methods of surface preparation is the Tudor plate, best known in Europe, and made by casting thin ribs like paper cutters and then firmly binding them together. The National Storage Battery Company employs a modification of this type made by "swaging" ribs and webs from a sheet of pure lead instead of by casting. Still another Plante plate is made with "rosettes," which are spiral coils of lead ribbon and forced into round holes in the lead grid to form a good contact so necessary for all active elements.

Antimony is usually mixed with the lead before casting the grid to make it stronger. The early process of formation, by which is meant the changing of the positive to lead peroxide and the negative to a porous sponge lead, was too long and expensive for any commercial possibilities, but the idea is important because it is the basis of all forming processes. The flat identical plates were placed in the dilute H_2SO_4, much more dilute than nowadays, and subjected to a series of reversals of current.

The immersion caused a very thin coat of $PbSO_4$ to form on both plates until it protected the plates from further action. Then they were charged in one direction; discharged and charged in the other direction; each charge converting $PbSO_4$ to PbO_2 and Pb, the peroxide forming on whichever plate was the anode. The capacity was small and the formation of PbO_2 and $PbSO_4$ on

the solid lead caused a hard, impenetrable layer of these substances which prevented further action. At only a part of charge or discharge could the chemical action penetrate deeper, and rests were necessary to permit local action on the peroxide plate to add to its sulphate. Hence months were spent in obtaining plates comparable to those formed in a week or so to-day. It was soon found that ribs increased the capacity of the plates. Next etching was done before forming, to roughen the surfaces, thus increasing their penetrability. An attempt was made to form a compound on the surface which could immediately be transformed to peroxide by a single change. This was done by subjecting the plate to the action of sulphur, which reduced the surface to lead sulphide; thence to sulphate, which could easily be converted to the desired PbO_2 on a single charge.

The addition of what is known as a forming agent to the electrolyte of the forming tank then came in. This marked a great advance and is the same principle employed in the modern rapid forming process. The forming agent is an acid capable of forming lead salts soluble in the agent but not in sulphuric acid. Such agents may be nitric acid, acetic, or hydrochloric acid; and the soluble salts they form with lead are nitrates, acetates and chlorates. When introduced into the electrolyte and the charging current is started, the SO_4 ion carries current through the electrolyte by actual migration of the ions to the anode, together with the similar or negative ion of the agent. These ions are of course moving in the opposite direction from the metallic or hydrogen ions of the acid, the latter moving in positive direction or to the cathode, being marked + (plus).

Now to go back to our negative ions, SO_4 — — and NO_3 — traveling together, we see that a layer of soluble lead salt in solution is formed by the agent at once, but lasts only an instant. The SO_4 ions are there at the same time, and SO_4 having a greater affinity for the lead, crowds out the forming ion and immediately precipitates $PbSO_4$. The regular charging action then comes into play, and the sulphate is changed to PbO_2 which we want, while the forming ion which was liberated by the union of SO_4 — — with the Pb ion of the soluble compound eats into the plate to form more soluble material. This is precipitated by the SO_4 ion again, and so the ion of the agent keeps forming a solution on the surface of the plate and immediately loses it to the SO_4. So this

interesting formation goes on and on, but the relative concentrations of the two ions must be carefully balanced or the forming ion will be swallowed up by the sulphate; or if there is too much forming ion it will make a film of the soluble lead salt between the plate and the sulphate, and the sulphate, therefore, finding no grip on the plate, must flake off as useless sediment, never to be returned to active life. Below is a little picture representing the advance of the forming agent into the plate, followed closely by the sulphate and then the peroxide.

The great danger of forming agents is their persistence in the plate, which could cause them during each charge to attack the plate in service until it was soon reduced to lead sulphate too thick

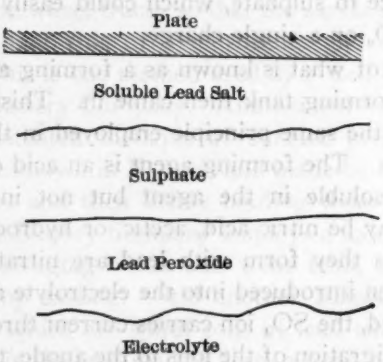

FIG. 1

to be converted to peroxides. However, chlorine is evolved so readily that if HCl is used it must be renewed often in the forming tank. Nitric as a forming agent is broken up into nitrous acid and finally reduced to ammonium sulphate, so these are eliminated in a few cycles. Acetic is the most persistent and will ruin the plates if left after formation. There are many secret formulas for the agents and the proportions to be used in this type of formation. Those that are specified are wrong so as to mislead competitors.

The other Plante formations might be classified as electrochemical, electrolytic and amalgamating, but are somewhat the same, and cannot be touched in this lecture; but before leaving the subject of Plante formation it will be interesting to note that the process described applies to both negative and positive plates

alike. All are made positive by the help of permanent dummies for the cathode, and then the negatives, or rather, the plates to be made into negatives, are easily converted to sponge lead, Pb, by a separate charge in the opposite direction, called a reversal.

Camille Faure hit on the process of mixing up a lead oxide paste with sulphuric acid and other substances to increase its conductivity, porosity and toughness, and pasting it onto grids for support and conducting, he had a plate nearly ready for immediate use. The paste so applied is allowed to dry and harden and then by the forming process with dummy opposites as in the Plante method, the anode becomes the peroxide plate, or if connected as cathode, it becomes the negative, for in the voltaic couple it is at the cathode the oxide is reduced to sponge lead, while mostly water and some hydrogen are formed at the dummy.

Actually the active material paste is litharge PbO for the negative and minimum Pb_2O_8 or red lead Pb_3O_4 for the positive. The acid needs no forming agent, and in practice is about 1.120 specific gravity. After drying for a week a charge for a few hours forms the negatives, but 70 hours is required for a slow forming charge for the positive. The rated capacity of the plates is not obtained until after several cycles of use. At start the plate contained PbO, 55 per cent; PbO_2, 25 per cent; $PbSO_4$, 20 per cent; and these by the forming charge are reduced to PbO, 9 per cent; PbO_2, 88 per cent, and $PbSO_4$, 3 per cent.

Pasted plates, as would be supposed, are not as lasting as the solid Plante plates, and the porosity which we try to obtain is the very cause of their comparatively short life. The more efficient the cell, the more porous its active material, and the more readily it disintegrates, so the electrical efficiency varies inversely as the life we must expect. For this reason, many attempts have been made to increase the holding power of the grids and this has led to many types and multitudinous patents. Perhaps the best developed is the lattice grid of the Exide Storage Battery Company, of Philadelphia, which is favored in the navy.

This company now makes a variation of the straight Faure type in which square pellets of lead chloride are made up and fitted into a grid covered on both sides with a thin perforated lead sheet. The electrolyte finds easy access through the perforations and the active material, which has little cohering qualities, is prevented from dropping by the two cover sheets. The nature of the plate

suggested the name "box," and as it is extensively used for the negative element, the term "box negative" is its popular name.

Having taken up the subject of the two plate systems, the Plante and the Faure or pasted, the lead and sulphuric cell should be compared with Edison's alkaline battery, but I will leave that for a minute and give a brief account of the electrolyte of the lead sulphuric and what takes place in it.

Usually the specific gravity of a lead cell electrolyte should be betweeen 1.210 and 1.260 when fully charged, but the range can be extended to meet the demand of the conditions of service. The drop in specific gravity on discharge of an Exide cell taken as representative of the pasted type is as much as 80 points, showing the great amount of SO_4 radical which is formed into lead sulphate. It is this amount of lead sulphate which determines the capacity of our cell. In the submarine is needed maximum capacity for weight, and hence there is a lot of active material and little space for electrolyte; and the acid concentration must be as high as life considerations will permit. Up to a specific gravity of 1.240 the internal resistance decreases, being a minimum at that point, so the requirement of least internal resistance can be well met. Readings of specific gravity are taken in a pilot cell, which is used as an indication of the conditions of the other cells in a battery, and this is one means of knowing how much of a charge is in the battery. The specific gravity decreases with rise in temperature by one point (that is one-thousandth) in gravity for each rise of 3 degrees Fahrenheit temperature, so the readings can be corrected easily to bring them to the standard at 60 or 70 degrees. One of the most important things to care for is the cleanliness of the cell and purity of electrolyte, and after that is always insured, regularity of charge and discharge, remedy of internal shorts, and care not to allow the battery to stand idle after discharge, will go a long way to success in the operation of a battery.

Iron, chlorine, arsenic, mercury, nitrates, acetates or the least bit of platinum in electrolyte will harm the plates. All battery companies ship specially prepared pure diluted acid in carboys and the navy used to purchase it that way; but any pure acid tested for the above impurities may be mixed by adding it to pure distilled water, never, by the way, adding water to the acid on account of the danger from splashing caused by the heat. In mixing, a thermometer must be used, and remember that the

mixture will be of greater gravity when it cools. About every two weeks, and according to the work of a battery, the evaporation must be replaced by pure water so as to keep the tops of all plates covered. Very little acid is lost by evaporation, so if you have to add acid to keep up specific gravity, it is a sign that you have neglected the battery by allowing sulphated plates to stand idle and catch the dreaded "white plague," which means the $PbSO_4$ formed on a discharge or by local action has hardened into a hard, insoluble crust. Plates are sometimes hauled out of a battery with the negative, properly a light slate-gray color, all coated with white sulphate like a white fungus growth, and the chocolate colored positive looking almost gray. This condition can be cured only by long overcharges and violent gassing or ebullition of the electrolyte, which tears off the insoluble sulphate and good active material as well to deposit them as dead sediment in the "mud" space under the plates.

In submarine boats deep rubber jars are used for containers and placed in a lead-lined wooden tank. This slop tank, as it is called, affords an air protection around the battery and catches all acid which may accidentally be spilled. The ventilation of the battery is extremely important and is accomplished by blowers which draw fresh air from the living space over the tops of the plates on each row of cells and discharge overboard, or into the living space again, if submerged. Since hydrogen gas is very explosive, it can be seen how easy it might be for an imperfect contact on a ground or short to blow up the battery. Such explosions do occur. I think there were about six in the Atlantic flotilla last year, and one of them was severe enough to wreck something like 26 cells, besides smashing most of the deck boards which cover the battery.

A few other points about the electrolyte to be remembered are that a surprisingly small quantity of salt water will evolve enough chlorine to ruin all plates in the cells it reaches, as well as knock out all hands in the boat. Last spring, 1914, the *D-2,* in the second group of the Atlantic submarine flotilla, had the misfortune to find a hole torn through the lead-lined slop tank, and after filling a gasoline tank directly beneath, discovered the slop tank well filled with gasoline. Next, the *E-2,* while maneuvering submerged in late summer, had a similar experience, but this time the slop tank leaked into the main ballast, which was filled with sea water. The

commanding officer wisely closed kingston valves and pumped the ballast tanks instead of putting air pressure on them to blow out the water, and thus prevented the possible disaster of flooding the entire battery. Enough chlorine was generated, however, in the very short time before opening hatches to turn all the interior bright work green with a corresponding effect on the crew.

Trouble in a single cell soon spreads to others when tandem plates are used, and may be expected to show lowered specific gravity for the affected cell on the complete inspection that should be made at every replenishing of electrolyte. In a power house using glass jars the color of the plates will aid in locating the shorts that cause the trouble, but in a submarine boat the voltage across the plates taken while discharging at the normal rate, or at least while not on open circuit, and also hydrometer readings, will suffice to discover the short. A direct-reading portable voltmeter is connected to alternate plates in turn. A more precise method is the use of the cadmium tester, which is briefly described as follows:

It is necessary that every plate, positive or negative, be fully charged, for voltage and consequently capacity depends on the state of charge in each plate. The negative plate being the anode on discharging, must be electropositive to the positive plate, which is the cathode. In a healthy state, both may be considered charged on an opposite side of a line of zero potential. Pure cadmium enclosed in a perforated rubber tube makes an excellent starting point, by virtue of its steadiness and wearing qualities. Connected to one terminal of a portable voltmeter, it is immersed between two plates, so as to be clear of both. Then the other contact, merely a steel pricker, is pressed against the hanging bar of the alternate positive and negative plates across the cell, and the difference of potential between each one and the cadmium strip marks the voltage or state of charge of that plate.

Cadmium is electropositive to both plates when they are discharged, and lies between them when they are charged. This will be clearly understood when recalling the fact that voltaicly considered the plates of a storage battery are misnamed from an electrician's standpoint. The so-called positive plate is really the negative electrode on discharge, PbO_2 being below Pb on Volta's list of electrochemical substances. The discharging current flows internally from the anode Pb to the cathode PbO_2. Now the Pb

plate lies below cadmium until it is charged, when it becomes electropositive to cadmium. The PbO_2 plate becomes more highly negative to cadmium when charged, but always remains negative to cadmium. The sketch below shows the relative position of the cadmium to the Pb and PbO_2 plates at full charge and discharge; and by the absolute difference between each plate and cadmium, taking care which way the needle swings, we know the condition of each plate.

In the figure, which is somewhat out of scale, the relative positions of Pb and Cad are plainly shown. Positive directions are toward the right. It is seen from the figure that the difference of potential between the plates will be the sum of the two separate readings when charged, and the difference when discharged. If

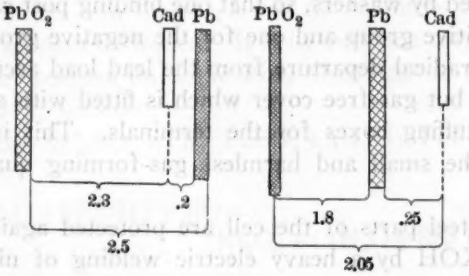

FIG. 2

the negative is not in a healthy state, its difference from cadmium will be very small.

It is perfectly possible to discharge below the limit of 1.8 volts per cell, but dangerous for reasons of possible reversal of an already low cell, which would cause undue expansion of its plates, buckling or warping, and disintegration of the active material.

There are several types of Edison storage cells, all made by the Edison Company, but all are identically the same except as to size and capacity. The greatest capacity from a single Edison cell is 10,000 ampere hours. The description of the mechanical details of this battery, now coming into prominence, may not be familiar to every one of us, so I will briefly give it before going on to the chemical reactions which are more properly the subject in hand.

First of all, we have no sulphuric acid, no lead plates, none of the familiar aspects of the old lead load battery. The positive

element is nickel hydrate, the negative, iron oxide, and the electrolyte, a 21 per cent solution of caustic potash (KOH). The container is steel.

Instead of the old type of positive plates, we must look for a radical change. They now consist of 15 or 30 perforated steel tubes, heavily nickel plated and filled with alternate layers of hydroxide of nickel and pure metallic nickel in excessively thin flakes.

The negative or iron plate consists of a grid of cold rolled steel holding a couple of dozen perforated steel pockets filled with a finely powdered iron oxide. These pockets are forced into intimate contact with the grid by a corrugating hydraulic press. The similar plates are bolted together horizontally at their tops and evenly spaced by washers, so that one binding post can be utilized for the positive group and one for the negative group.

Another radical departure from the lead load accumulator is a water-tight but gas-free cover which is fitted with a filling aperture and stuffing boxes for the terminals. This is possible by virtue of the small and harmless gas-forming qualities of the electrolyte.

All the steel parts of the cell are protected against corrosion from the KOH by a heavy electric welding of nickel plate in intense heat and in an atmosphere of hydrogen, which makes the plating practically homogeneous and entirely free from pores.

Coming now to the most interesting chemical reactions, we find the complexities are as severe as we want to make them, but it is hardly necessary to go below the primary equations. And these are simple enough. On first charge the iron oxide Fe_2O_3 of the negative loses its oxygen, as did the negative in the forming process for the lead load cell, and becomes pure iron, while on discharge it regains part of its original oxygen, becoming Fe_3O_4. The nickel hydroxide of the positive changes to NiO_2 on charge, and on discharge loses part of its oxygen, becoming Ni_3O_4. The electrolyte KOH aids the transformation, but remains unchanged during the process of charge or discharge. After first charge the chemical action is represented by

$$6NiO_2+4H_2O+8KOH+3Fe=2Ni_3O_4+4H_2O+8KOH+Fe_3O_4,$$

which is perfectly reversible, reading discharge from left to right and charge from right to left. This goes on with never a change in the electrolyte, the elements exchanging oxygen one to the

other and never losing an ounce of metallic weight in the form of sediment.

The analogy between the discharge-charge equation to the corresponding reaction in the lead load cell is very evident, for recalling

$$PbO_2 + 2H_2SO_4 + Pb = PbSO_4 + 2H_2O + PbSO_4,$$

it is seen that the positive plate exchanges oxygen for the sulphate ion of the electrolyte while the negative gains oxygen from Pb to $PbSO_4$, thus:

$$PbO_2 + 2H_2SO_4 + Pb = PbO + 2H_2SO_4 + PbO =$$
$$PbSO_4 + 2H_2O + PbSO_4,$$

these symmetrical equations showing how the oxygen is carried by the electrolyte to the negative in the first step of the lead load discharge, and then how the SO_4 ion of the sulphuric finds greater affinity for lead than hydrogen. It is in the same way that in the Edison cell the positive loses one atom of oxygen to the negative and the similarity between

$$PbO_2 + 2H_2SO_4 + Pb = PbSO_4 + 2H_2O + PbSO_4$$

and

$$6NiO_2 + (4H_2O + 8KOH) + 3Fe =$$
$$Ni_3O_4 + (4H_2O + 8KOH) + Fe_3O_4$$

is marked.

The Edison Company guarantees its battery for a period of five years, and even when used in delivery wagon or trucking service guarantees that it will show at least 90 per cent of its rated capacity after three years from date of delivery to the purchaser. At present there are no such batteries used for main propulsion of our submarines, but the department has been contemplating installation and has carried on very extensive tests ashore. At present the greatest drawback is initial cost.

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SOME NOTES ON THE PRINCIPLES OF THE GYROSCOPIC COMPASS, PARTICULARLY THE SPERRY GYROSCOPIC COMPASS

By COMMANDER LOUIS M. NULTON, U. S. Navy

While in command of the U. S. S. *Montana*, a Sperry gyroscopic compass was installed on board. Being unfamiliar with the underlying principles of operation of the gyroscopic compass, these notes represent information which I, as the captain of the ship, desired to have, and which I could not find in print in the form I desired. They are merely my own personal notes in explanation of one point or another as each point arose. They are qualitative, not quantitative, in character and are designed to create a conception of principles.

In its ordinary definition, a gyroscope is an instrument for illustrating the laws of rotation, and consists essentially of a heavy rotating wheel, the axis of which is free to turn in any direction, and may be acted upon by external couples or forces.

Such an instrument is shown in Fig. 1.

The gyro wheel *A* is capable of spinning on its axis, *xx*, which axis is supported by the frame *BB*. Frame *BB* is at the same time capable of rotating around the axis, *yy*, which axis is supported by the frame *CC*. Frame *CC* is at the same time capable of being rotated around the axis *ZZ*. The above construction permits the axis of spin *xx* of the gyro wheel to turn, or point, in any direction in space.

The gyro wheel *A* has some peculiar characteristics. For example, suppose we start it spinning around its axis, *xx*, and then, while it spins, lift it out of its mounting, holding it between the thumb and first finger thus: Fig. 2.

We may move the wheel in space in any direction, *and so long as the axis, xx, remains parallel to its original position and the wheel is spinning* no special results of any kind will be noted.

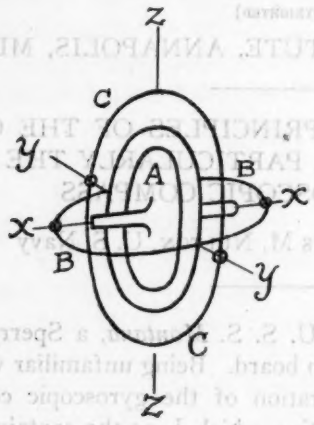

FIG. 1

FIG. 2

For example, the axis of the wheel while spinning may be moved to the successive positions 1, 2, 3, 4, 5, 6, 7 as in Fig. 3, and so long as each movement carries the spinning axis *through space*

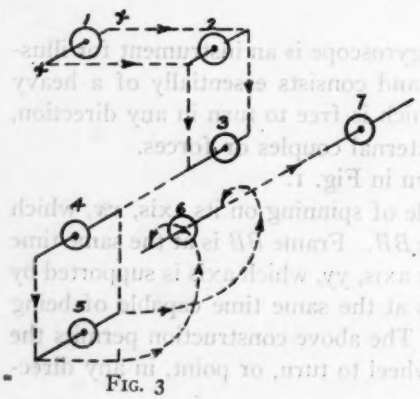

FIG. 3

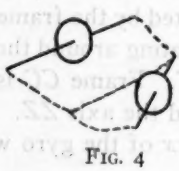

FIG. 4

FIG. 5

parallel to itself no special phenomena present themselves. If, however, the spinning wheel be moved in such a way as to produce rotation of the spinning axis as in Figs. 4 and 5, instead of mere translation, most curious and striking results occur.

There is felt first a definite, positive, *resistance* to this rotating movement of the axis accompanied, at the same time, by a curious wriggle and tilting of the wheel and its axis *xx*. This resistance, and its accompanying wriggle, follow definite laws and possess the secret of the gyroscope and the gyroscopic compass. Unless this cause and effect is remembered in its physical sense, it is useless to attempt to understand the principles of the gyro compass.

THE "WRIGGLE"-PRECESSION

Suppose (in Fig. 6) while the wheel is spinning in the direction shown by the arrow, *a*, we put a light, steady pressure on each end of the axle of spin, *xx*, so as to tilt this axis by the couple *PP*. The result is astonishing in that the axis of the spin, *xx*, will resist

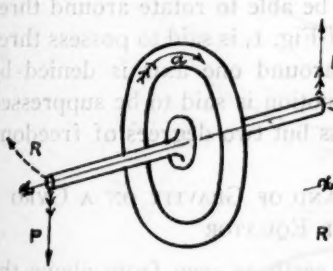

FIG. 6

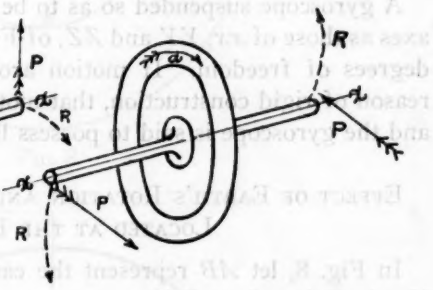

FIG. 7

being tilted, and will move off in the direction *RR at right angles* to the plane of action of the couple *PP*, which is producing the tilting. Suppose in Fig. 7 we apply a couple tending to rotate *xx* as shown by the arrows *PP*. What is the result? It is equally astonishing—*xx* will resist rotation by the couple *PP*, and will at once tilt in the vertical plane in the direction *RR at right angles* to the plane of the couple *PP*. This effect in the spinning gyroscope always follows this cause, or this cause always produces the above-noted effect, and *it is the application of this principle which permits the gyroscopic compass.*

It is not necessary for the dabbler in applied science to be able to understand the mathematics of the gyroscope, but he must be able to remember the physical phenomena here presented as "cause and effect," if he desires to understand the principle of the gyroscopic compass.

Referring to the conditions represented in Figs. 6 and 7, the movement of the axis of spin, xx, in a plane perpendicular to that of the couple applied to it is called a "precessional motion" or "precession." The application of the couple is said to cause the spinning wheel to "precess."

It doesn't matter whether the initial position of the spinning axis in space is horizontal, vertical or tilted, the *relations of the directions* of the precession and its producing couple are the same.

Again, referring to Fig. 3, it is recalled that moving the spinning axis, xx, parallel to itself in space does not produce precession. Conversely, unless the gyroscopic system of Fig. 1 is acted upon by external forces tending to produce precession the spinning axis always points in the same direction *in space, i. e.,* remains parallel to itself *in space.*

A gyroscope suspended so as to be able to rotate around three axes as those of xx, YY and ZZ, of Fig. 1, is said to possess three degrees of freedom. If motion around one axis is denied by reason of rigid construction, that motion is said to be suppressed and the gyroscope is said to possess but two degrees of freedom.

EFFECT OF EARTH'S ROTATION AND OF GRAVITY ON A GYRO LOCATED AT THE EQUATOR

In Fig. 8, let AB represent the earth as seen from above the North Pole. Let G be a gyroscope spinning at the celestial equator, at the end of the radius, NG, with its axis, xx, horizontal and standing east and west, the gyro being so far away, in space, from the earth that it is *not* affected by gravity.

After a certain length of time, the earth will have rotated until the gyro is at the position G_1, Fig. 9, then in the case of the gyro with three degrees of freedom, *i. e.,* uniformly suspended and free to turn in all directions in space, the axis of spin, xx, would no longer be horizontal as regards the surface of the earth, but the condition would be as shown at G_1, Fig. 9, the gyro having kept its spinning axis parallel in space to the original position which it occupied when at G in Fig. 8. Under this assumption there would be no precession.

Suppose now, Fig. 10, the gyro be moved in towards the earth's center, along the radius. As it approaches the earth's surface, the force of gravity is caused to act in the gyro compass to make the axis of spin, xx, take a horizontal position $x'x'$, relative to the earth's surface, and in so doing will cause this axle to tilt through

the angle θ. Recalling the discussion of Figs. 6 and 7, we see that the rotation of xx to $x'x'$, will cause precession of this axis so that the gyro finally occupies the position of G_3 in which the plane

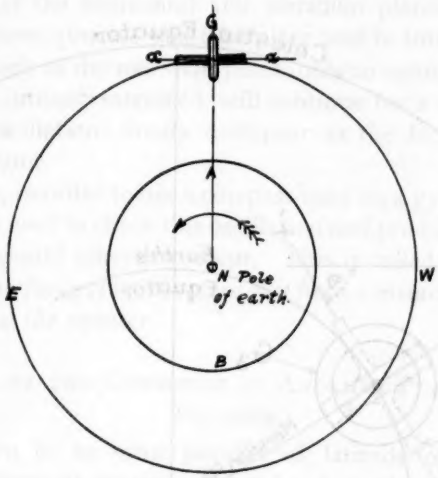

FIG. 8

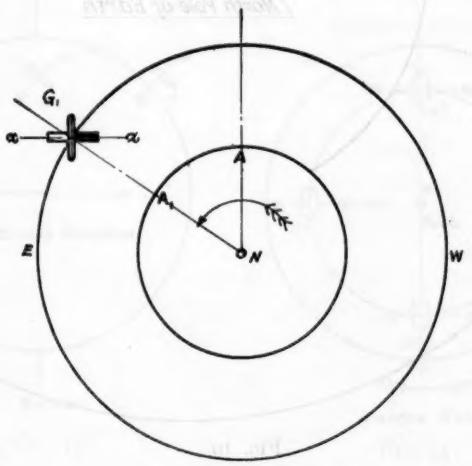

FIG. 9

of the spinning wheel coincides with the plane of the equator, while the axis of spin lies in the vertical plane through the earth's axis, *i. e., the axis of the spinning wheel* lies in a meridian plane and thus points true north and south.

So long as the force of gravity acts in this manner to tilt and keep the gyro's spinning axis horizontal to the earth's surface, just so long will the precession caused by the resultant of this and

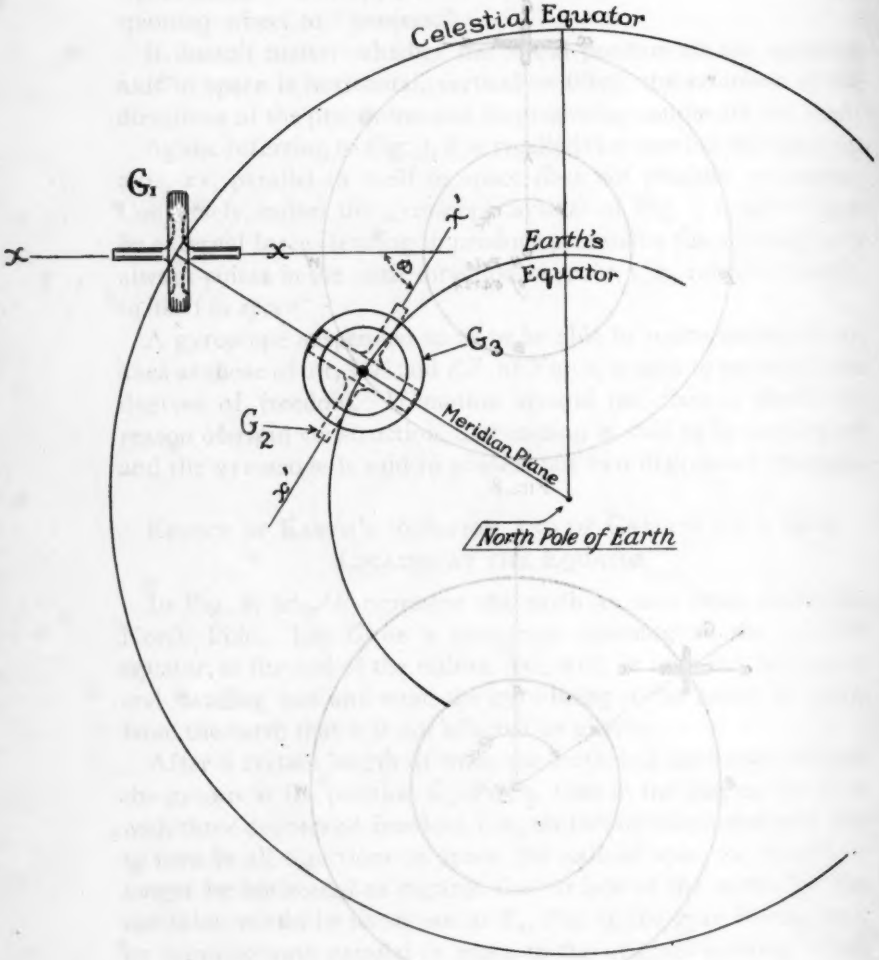

FIG. 10

the earth's rotation cause the gyro's spinning axis to point true north and south, unless acted upon by some force tending to throw it away from the meridian. A compass card may be so mounted on this axis as to show true compass readings.

OSCILLATION—DAMPING

But the mass of the gyro wheel possesses inertia, and as the wheel passes from the position G_2 to G_3 its inertia will carry the axis, xx, past the horizontal and meridian planes. When this occurs, a reverse process will take place and in time the axis, xx, be brought back to the meridian plane, only to again swing past it. This process, unless restrained, will continue for a very long time before the oscillations finally disappear as the forces come into final equilibrium.

Practically, in order to use a compass card on a gyro, mechanical processes are used to check this oscillation and produce equilibrium sooner than would otherwise occur. This is called damping.

In all of the foregoing, the gyro has been considered as stationary on shore at the equator.

THE ACTION OF THE GYROSCOPE AT ANOTHER PLACE THAN THE EQUATOR

If the gyro be at some parallel of latitude other than the equator, the force of gravity is caused to keep the axis of rotation

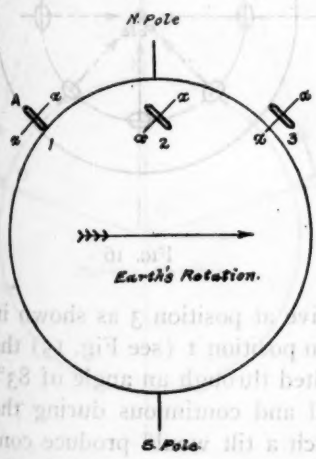

FIG. 13

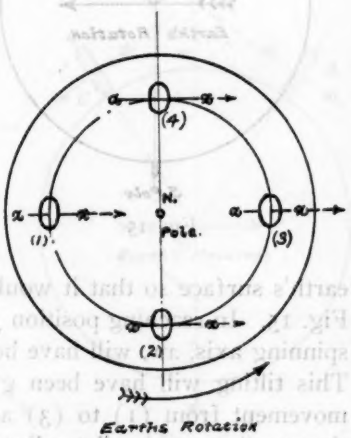

FIG. 14

of the gyro horizontal to the earth's surface and turned into the meridian line, *i. e.*, pointing to the earth's poles, in a manner similar to that discussed in Figs. 8, 9 and 10. For illustration: Assume

NOTE.—Figures 11 and 12 of the original manuscript are combined in Figure 24A.

the gyro of three degrees of freedom at *A*, Fig. 13, to be *not* acted upon by gravity. Then as the earth rotates, the spinning axis, *xx*, under this assumption would move through space parallel to itself as indicated in the successive positions 1, 2, 3, 4 of Figs. 13 and 14.

However, as a matter of fact, with gravity acting, the gyro would not arrive at 3 in the position shown in Fig. 13 for its spinning axis, *xx*, would be held, by gravity, horizontal to the

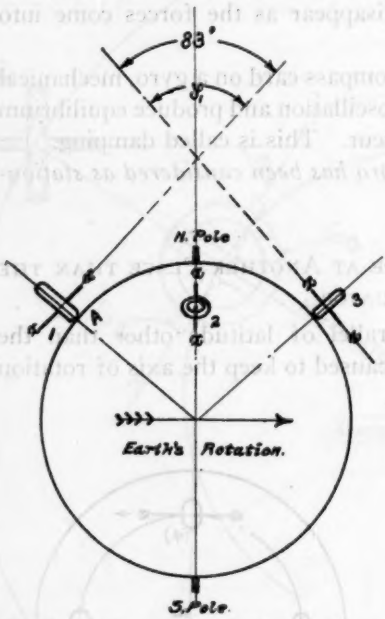

FIG. 15

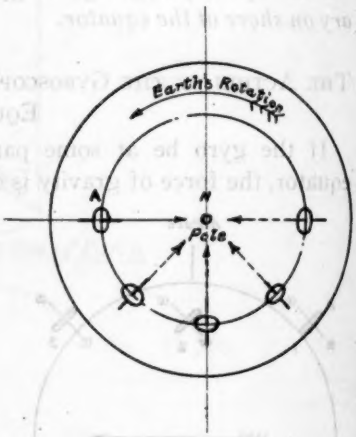

FIG. 16

earth's surface so that it would arrive at position 3 as shown in Fig. 15. In reaching position 3 from position 1 (see Fig. 15) the spinning axis, *xx*, will have been tilted through an angle of 83°. This tilting will have been gradual and continuous during the movement from (1) to (3) and such a tilt would produce continuous "precession" tending to keep the spinning axis in the meridian plane, *i. e.*, pointing true north, as shown in Fig. 16.

FURTHER LATITUDE CONSIDERATIONS

Suppose the gyro instead of being located at a place whose latitude was *A*, as in Fig. 15, was located at latitude *B* or *C* as shown

in Figs. 17 and 18, respectively. A study of the figures will show that the angle ϕ, through which the spinning axis, xx, must tilt in order to remain horizontal to the earth's surface, is less for latitude B, and greater for latitude C, than it was for the place whose

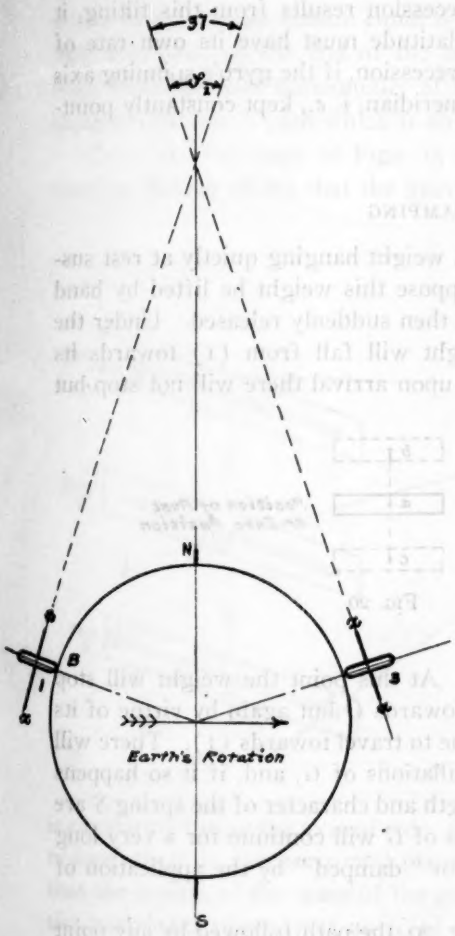

FIG. 17

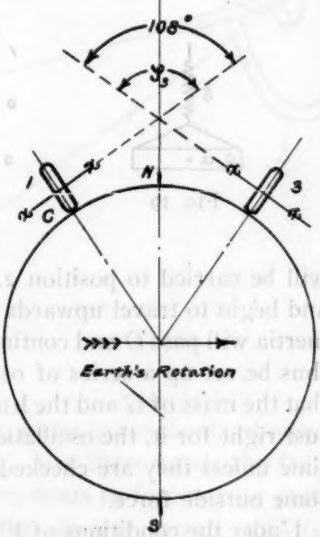

FIG. 18

latitude was A. Furthermore, as the earth rotates around its own axis once in 24 hours, each gyro has required the same absolute amount of time, *i. e.*, 12 hours, to move from position (1) to position (3) regardless of whether its latitude is that of A, B or C.

But in this same length of time, one spinning axis has tilted through an angle $\phi_1°$, the other through angle of $\phi_2°$, the third through an angle $\phi_3°$, each differing from the other and dependent upon the latitude. Thus the rate of tilting of xx must vary for different latitudes, and as precession results from this tilting, it follows that each particular latitude must have its own rate of tilting, and resulting rate of precession, if the gyro's spinning axis is to be kept turned into the meridian, *i. e.*, kept constantly pointing true north.

DAMPING

Suppose, in Fig. 19, G be a weight hanging quietly at rest suspended by the spring S. Suppose this weight be lifted by hand to the position 1, Fig. 20, and then suddenly released. Under the influence of gravity the weight will fall from (1) towards its previous position of rest, but upon arrival there will not stop but

FIG. 19

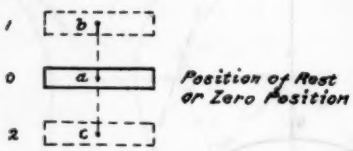

FIG. 20

will be carried to position 2. At this point the weight will stop and begin to travel upwards towards O but again by virtue of its inertia will pass O and continue to travel towards (1). There will thus be set up a series of oscillations of G, and, if it so happens that the mass of G and the length and character of the spring S are just right for it, the oscillation of G will continue for a very long time unless they are checked or "damped" by the application of some outside force.

Under the conditions of Fig. 20, the path followed by any point a, of G, would be the vertical straight line of bc. Now, in Fig. 21, let a slot be cut in G and in this slot one end of the axis of spin, xx, of a spinning gyro wheel be inserted as at a, position O, Fig. 21. Let G now be started oscillating in the same manner as described for Fig. 20. As G rises and falls in the vertical plane, it will cause xx to rise and fall (tilt) with it, but recalling the

principle of precession explained by Fig. 6, we see that *xx* will not only rise and fall with *G* but will precess right and left as illustrated at positions (1) and (2), Fig. 21, so that while the end of *xx* travels in a vertical oscillation equal to *bc* of Fig. 20 it has also a horizontal oscillation equal to *de* of Fig. 21. The result is that any point on the end of the axis of spin, *xx*, is oscillating both vertically and horizontally at the same time and, in consequence, describes a path which is an ellipse.

Now a careful study of Figs. 15 to 18, inclusive, with the text relating thereto shows that the gravity couple (force of gravity)

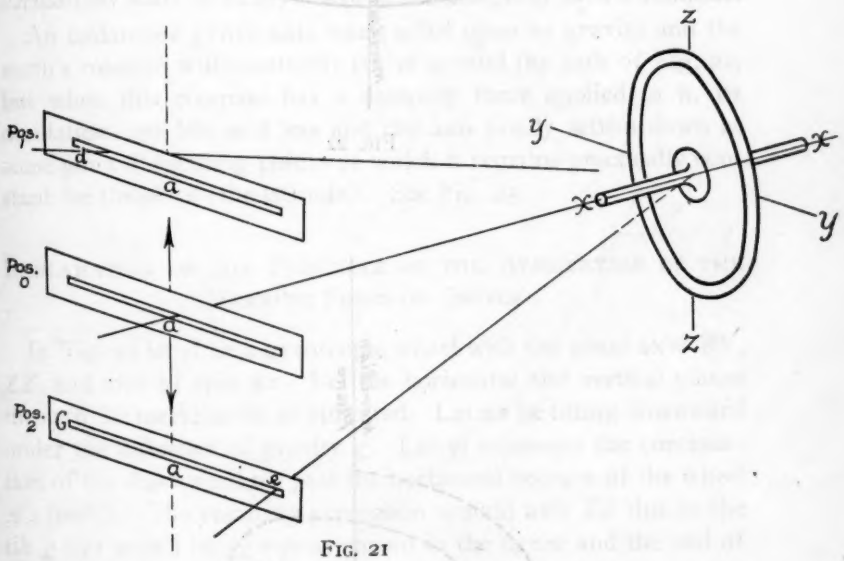

FIG. 21

is constantly tilting the axis of spin, *xx*, of the gyros therein shown, to keep them in the horizontal plane. Also there exists the fact that the inertia of the mass of the gyro tends to force *xx* on past the horizontal plane, just as *G* of Fig. 20 was forced past its middle, *O*, position, and that when forced past gravity tends to return it. So, in reality, in a spinning gyroscope there may be the same kind of vertical oscillations and corresponding precessions as indicated in Fig. 21 and these will continue unless checked or "damped."

In a gyroscope in which the oscillations just referred to are allowed to take place unchecked or undamped, the end of the axis

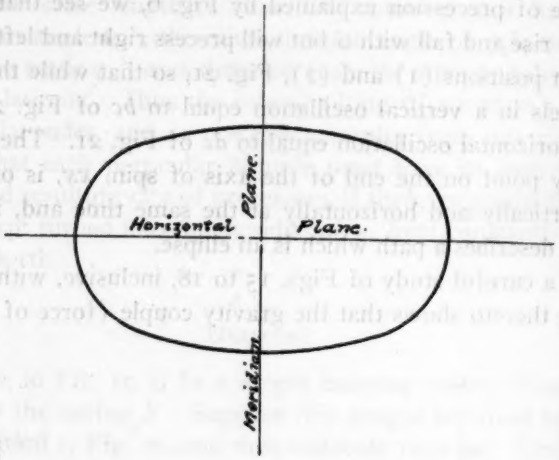

FIG. 22

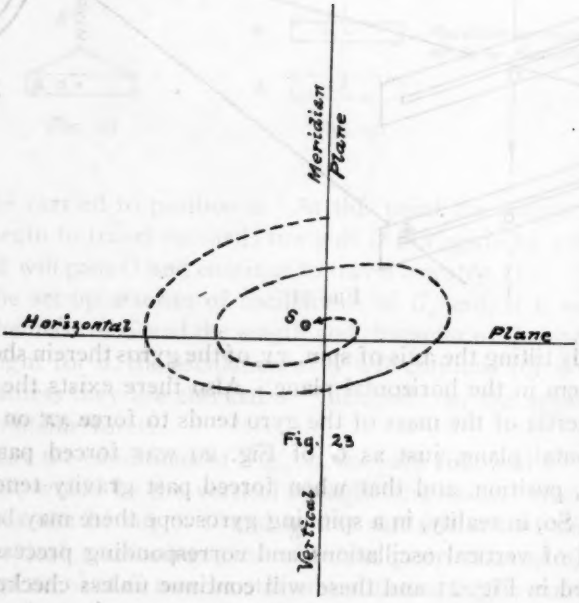

Fig. 23

FIG. 23

of spin is constantly describing a curve similar to that of Fig. 22.[1]

In a gyroscope in which such oscillations are unchecked or undamped, the oscillations continue for a very long time and render such a gyro useless for carrying a compass card, since such a card would be constantly oscillating (precessing) through a wide range on each side of the meridian thus producing a compass whose error was constantly changing from one instant to the next.

Hence, before a gyroscope can be used for mounting upon it a compass card that will be of any practical value whatsoever, *mechanical arrangements, of one kind or another, for damping oscillations must be incorporated in the design of such a compass.*

An undamped gyro's axis when acted upon by gravity and the earth's rotation will constantly travel around the path of Fig. 22, but when this compass has a damping force applied to it, its oscillations get less and less and the axis finally settles down at some point S (settling point) at which it remains practically constant for the place (the latitude). See Fig. 23.

EXPLANATION OF THE PRINCIPLE OF THE APPLICATION OF THE DAMPING FORCE OF COUPLE

In Fig. 24 let A be a gyroscopic wheel with the usual axes YY, ZZ, and axis of spin xx. Let the horizontal and vertical planes through the meridian be as indicated. Let xx be tilting downward under the influence of gravity g. Let gi represent the continuation of the downward tilt past the horizontal because of the wheel A's inertia. The resulting precession around axis ZZ due to the tilt $g+gi$ would be $pg+pi$ as shown in the figure and the end of xx would tend to take the position (2). Suppose, however, as xx approaches the meridian and tends to pass it to go on to (2) we forcibly turn it back around the axis ZZ by applying to it an external couple or force d. This rotation of A by d around the axis ZZ will cause tilting of xx around YY (the amount of tilt t being indicated in the figure), with the result that under the combined action of the gravity and damping forces the axis of the wheel will settle at some point S (called the settling point), very close to the meridian and horizontal planes and, in a properly

[1] Try this with a torpedo gyro.

designed, constructed and operated machine, will, for all practical purposes, remain at *S*. Any condition and direction of forces might have been taken for illustration and *S* might be either above or below the horizontal, or east or west of the meridian, but in any

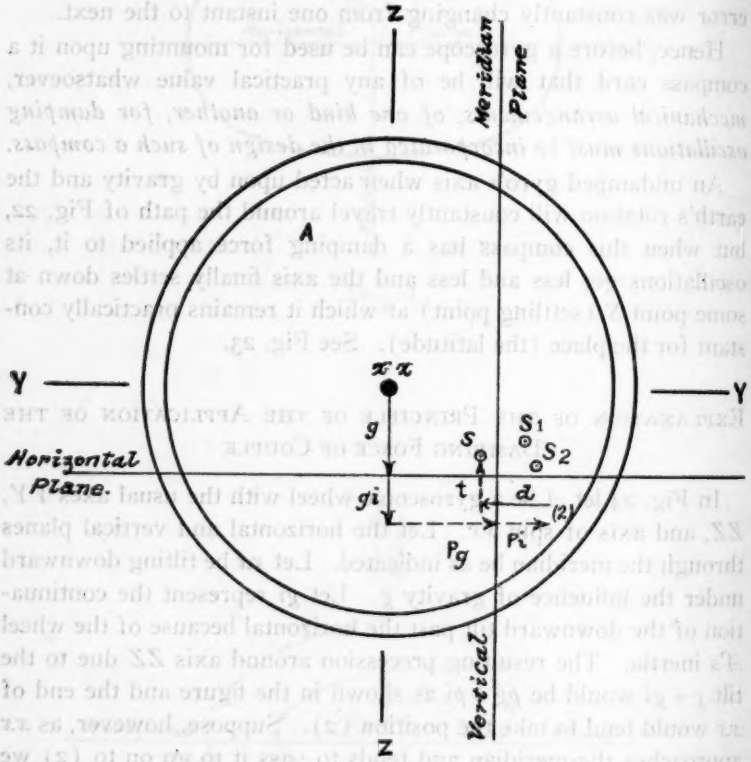

FIG. 24

case very small and practically constant so long as the gravity and damping couples (forces) act as just described.

In the earlier German compass the damping force or couple consisted in the action of an air blast tending to turn the wheel *A* around the axis *ZZ*; in the Sperry compass a connection or bearing eccentric to the axis, *ZZ*, produces a similar effect. *But in each*

compass damping must be produced if the compass is to be of any use to the mariner.[1]

The diagrams below show the character of the curves of damped and undamped oscillations in a gyro compass.

In Figs. 15, 17 and 18 it is shown that the spinning axis has tilted through 37°, 83° and 108°, respectively and that in each case it required the same amount of time, 12 hours, to do it.

The rate of tilting in each case is 3.0°, 6.9° and 9.0° per hour, respectively, and this rate is different for each and every position

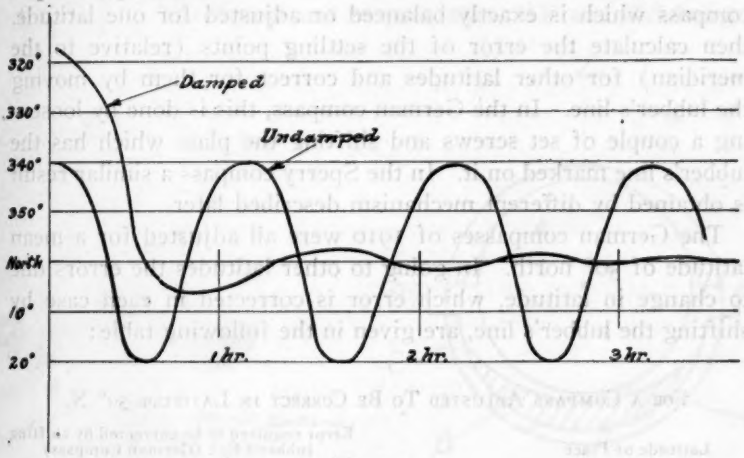

FIG. 24a.

in latitude. Or, to put it in another way, each and every latitude requires its own particular rate of tilting, *and resulting precession,* in order to turn the axis, *xx,* into the meridian and to keep the compass pointing true north.

[1] The following explanation of damping is by Mr. H. L. Tanner, of the Sperry Company:

"As the connection between the bail and wheel case is eccentric (see *e* Fig. 26), the torque applied to the wheel case is about a line inclined to the horizontal by an angle equal to the angle of eccentricity of the above connection. This causes precession about a line inclined the same amount to the vertical, *i. e.,* a line passing through the eccentric connection and the center of the wheel. This precession may be resolved into two components, one in a horizontal plane and one in a vertical, and it will always be found that the component in the vertical plane is in such direction as to decrease the angle of tilt of the wheel's axis, thus de-energizing it and reducing the amplitude of its oscillations about the meridian."

Bearing this in mind, and referring to the damping force d of Fig. 24, we see that d has to balance a rate of precession that varies with every change in latitude, and that unless this balance is absolutely exact for each latitude the compass will change the position of its settling point, S, upon a change of latitude so that while in one latitude it might settle at S, in other latitudes it might settle at S_1, or S_2 relative to the meridian plane. This balance is very difficult to accomplish in the actual building of a compass.

In practice, it is customary to mechanically construct a material compass which is exactly balanced or adjusted for one latitude, then calculate the error of the settling points (relative to the meridian) for other latitudes and correct for them by moving the lubber's line. In the German compass, this is done by loosening a couple of set screws and shifting the plate which has the lubber's line marked on it. In the Sperry compass a similar result is obtained by different mechanism described later.

The German compasses of 1910 were all adjusted for a mean latitude of 50° north. In going to other latitudes the errors due to change in latitude, which error is corrected in each case by shifting the lubber's line, are given in the following table:

FOR A COMPASS ADJUSTED TO BE CORRECT IN LATITUDE 50° N.

Latitude of Place	Error required to be corrected by shifting lubber's line (German Compass)
60° N.	0° 36′ easterly.
50° N.	None, compass designed for this latitude.
40° N.	0° 30′ westerly.
20° N.	1° 06′ westerly.
0°	1° 36′ westerly.
20° S.	2° 06′ westerly.
40° S.	2° 42′ westerly.
60° S.	3° 48′ westerly.

HOW THE GRAVITY COUPLE OR FORCE OF GRAVITY IS APPLIED IN THE GYROSCOPIC COMPASS TO KEEP TILTING THE SPINNING AXIS, xx, INTO THE HORIZONTAL PLANE

Throughout this paper the expression "gravity keeps the spinning axis turned into the horizontal plane" has been repeatedly used. (Study Figs. 10, 15, 17, 18 and 24.) Gravity is utilized to accomplish this as follows:

In the German compass of 1910 the casing carrying the gyro wheel is suspended from a hollow circular ring, *rr*, floating in a bowl of mercury *mm*. The gyro wheel casing is rigidly connected to *rr* by *H* and *Z*, and as *rr* floats horizontally on the surface of the mercury at every latitude, then *xx*, by the construction, is constrained to remain horizontal at every latitude.

In the Sperry compass, a similar result is obtained by a different construction.

In Fig. 26, *A* is the casing carrying the gyro wheel, *xx* its spinning axis; the horizontal and vertical axes, *YY* and *ZZ* being

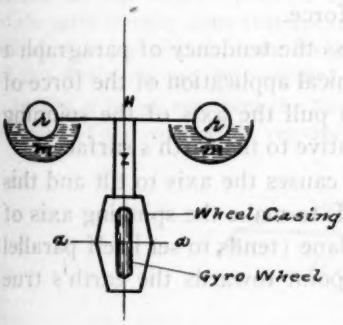

FIG. 25

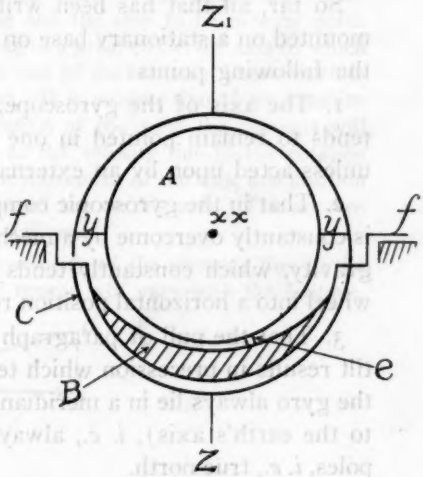

FIG. 26

shown also. Between the ring *C* and the wheel casing *A* is a weight *B* (called the "bail") supported at points *ff* outside of the gyroscope proper. Under the influence of gravity, this weight hangs in the vertical plane through *ff* whatever may be the latitude of the place. There are slots in *C* which allow *B* to do this. Between the wheel casing *A* and the weight or bail *B* there is at *e* a pin connection or bearing.

Now the bail *B* constantly hangs in the vertical plane, but the plane of the gyro wheel *A* tending to keep its position in space as the earth revolves will tend to separate from *B*. The flexible pin connection *e* prevents this and thus gravity acting by means of *B* through *e* constantly tends to keep the plane of the spinning wheel, *A*, vertical and its spinning axis horizontal.

THE DAMPING COUPLE

A study of Fig. 26 will show that when *A* and *B* tend to separate not only is the gyro wheel rotated around the *YY* axis, but if *e* be set off to one side of the axis *ZZ*, *A* will receive from *B* through *e* rotation around *ZZ*. This brings into play the damping force *d* as explained in Fig. 24. In this compass, *e*, of Fig. 26, is called the " eccentric bearing."

SUMMARY OF PRECEDING NOTES

So far, all that has been written refers entirely to a compass mounted on a stationary base on shore. The notes have indicated the following points:

1. The axis of the gyroscope, with three degrees of freedom, tends to remain pointed in one and the same direction *in space* unless acted upon by an external force.

2. That in the gyroscopic compass the tendency of paragraph 1 is constantly overcome by a mechanical application of the force of gravity, which constantly tends to pull the axis of the spinning wheel into a horizontal position relative to the earth's surface.

3. That the pull of paragraph 2 causes the axis to tilt and this tilt results in precession which tends to make the spinning axis of the gyro always lie in a meridian plane (tends to set itself parallel to the earth's axis), *i. e.*, always point towards the earth's true poles, *i. e.*, true north.

4. That because of the material gyroscopic wheel possessing mass and inertia, the foregoing combined causes produce oscillations in the spinning wheel, rendering it useless for carrying a compass card unless these oscillations are checked or damped.

5. That damping is an essential feature of every practical gyroscopic compass.

6. That a compass may be built to read correctly for one latitude but will be in error in another latitude.

7. That the error in any latitude, other than that for which the compass was designed, is allowed for by moving the zero point (lubber's line) to compensate for the error due to difference in latitude. This correction which is dependent upon the latitude alone is known as the " latitude correction."

THE COMPASS MOUNTED ON A MOVING SHIP[1]

The gyroscopic compass on a moving ship does not point exactly to the true north but constantly requires the introduction of some three positive, or negative, correction factors before one can ascertain the true location of the meridian.

[1] The following explanation of the deflection due to the actual movement of the ship north, or south, is due to the courtesy of Mr. Harry L. Tanner, Engineer of the Sperry Gyroscope Co.:

"If we assume the ship to be at rest and the earth rotating, the compass will assume a position with its axis in the plane of the earth's axis; then if we assume the earth to be standing and the ship to be moving north over the earth's surface, it will be moving in a great circle, the axis of which lies in the plane of the equator and the end of the compass wheel which is normally the north end will point west. It is evident that if we combine the movement of the ship and the rotation of the earth the compass will assume an intermediate position, and as the velocity due to the rotation of the earth is many times that due to the movement of the ship, this position will deviate but slightly from the plane of the earth's axis. The amount of this deviation may be computed as follows:

In Fig. 1 let *ab* represent the linear velocity of the compass due to the rotation of the earth (this velocity of course will vary with the latitude,

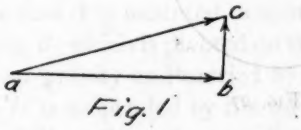

Fig. 1

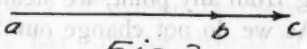

Fig. 2

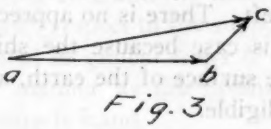

Fig. 3

being proportional to the cosine of the latitude) and *bc* the velocity of the ship with respect to the earth the resultant velocity will then be *ac* and the deviation of the compass will be equal to the angle *cab*.

In Fig. 2 the ship is shown with an easterly velocity *bc* and as *ac* coincides with *ab*, no deviation of the compass will be produced.

Fig. 3 shows the ship moving northeast and the angle *cab* is intermediate between that of Figs. 1 and 2. In practice, line *ab* is so long with respect to line *bc* that the easterly component of *bc* may be neglected and only the northerly component, which is equal to *bc* cosine ship's heading, need be considered.

Referring to Figs. 17 and 18, suppose we take the compass at latitude $B°$ of Fig. 17, mount it on board ship and steam true north at a speed of 10 knots per hour to the place whose latitude is $C°$ of Fig. 18.

By so doing we have steamed directly from a place at which the rate of tilting of xx was 37° in 12 hours to a point at which the rate is 108° in 12 hours. Suppose in starting from B, we had steamed 20 knots per hour instead of 10 knots. We would thus arrive at C in one-half the time it would have taken us at 10 knots and the rate at which this change in the tilt of xx takes place, as due to differences in speed, would be twice as great in the second case as in the first case. Thus speed is introduced as a factor.

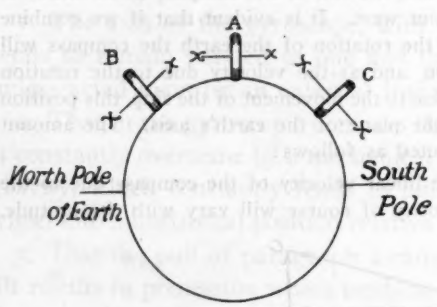

FIG. 27

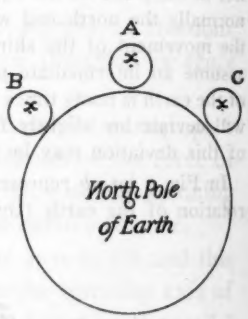

FIG. 28

Suppose, starting from any point, we steam true east at either 10 or 20 knots. As we do not change our latitude, the *rate* of tilting of xx is the same at every point at which we arrive as it was at any point we left. There is no appreciable disturbance of the compass from this case because the ships speed is merely additive to that of the surface of the earth, as the earth revolves on its axis, and is negligible.

Suppose we steam NE. true. Then the true *northerly component* of the ship's speed will have an effect, because it changes the rate of tilting of xx and as this northerly component depends upon the ship's course, the course is thus introduced as a factor.

The relative effects of moving the compass in north and south directions, *i. e.*, steaming on these courses, compared with movement in easterly or westerly directions is indicated very simply in Figs. 27 and 28.

In Fig. 27 let A be a gyro at the equator, the projection in Fig. 27 being on a meridian plane. If we steam true north or south from A to B, or to C, we do not transport xx parallel to itself in space but by introducing gravity cause it to tilt as shown, and this tilting of xx causes precession, the rate of which is affected, not only by the latitude we happen to be in, but by the speed with which we steam from A to B, or to C.

In Fig. 28 we have a projection on the plane of the equator. From A let us steam true east, or west, to B or to C. In so doing we have transported the spinning axis xx of the gyroscopic wheel *parallel to itself in space*, in consequence of which there is no resulting precession. See Figs. 2 to 5 and the text thereon. If we steam east or west from any other latitude we do not change the *rate* of tilting of xx, *hence* there is no change in precession due to an east or west course alone.

THE SPERRY COMPASS

Fig. 29 is a diagrammatic sketch of the Sperry compass. It is only intended to illustrate certain principles of construction and operation.

The gyroscope wheel A is mounted to spin on a horizontal axis, xx, within the casing B, which is pivoted on the horizontal axis YY through its center of gravity and carried by the frame or vertical ring D. The ring D is suspended by the tortionless strand E and guided by bearings ZZ' to allow a free oscillation of limited amount about its vertical axis ZZ' within the frame or phantom G.

The phantom G has a hollow stem H to which the strand E is attached at its upper end, and the stem forms a journal for rotation in azimuth with respect to the supporting base frame J. The frame J is mounted in gimbal rings $K'K'$ on the binnacle in the same or similar manner as the ordinary magnetic compass is mounted in its binnacle stand.

Secured rigidly to the stem H of the phantom is a large gear wheel, NN, having 360 teeth, one tooth for each degree of azimuth. This gear wheel can only move with the phantom and conversely when the gear wheel, NN, is moved the phantom must move.

Rigidly secured to the frame J, and thus fixed relatively to the ship is a motor, M, whose small spur wheel w engages with the teeth of NN. Mounted rigidly on NN is the compass card CC graduated to 360°. Flush with the surface of the compass card

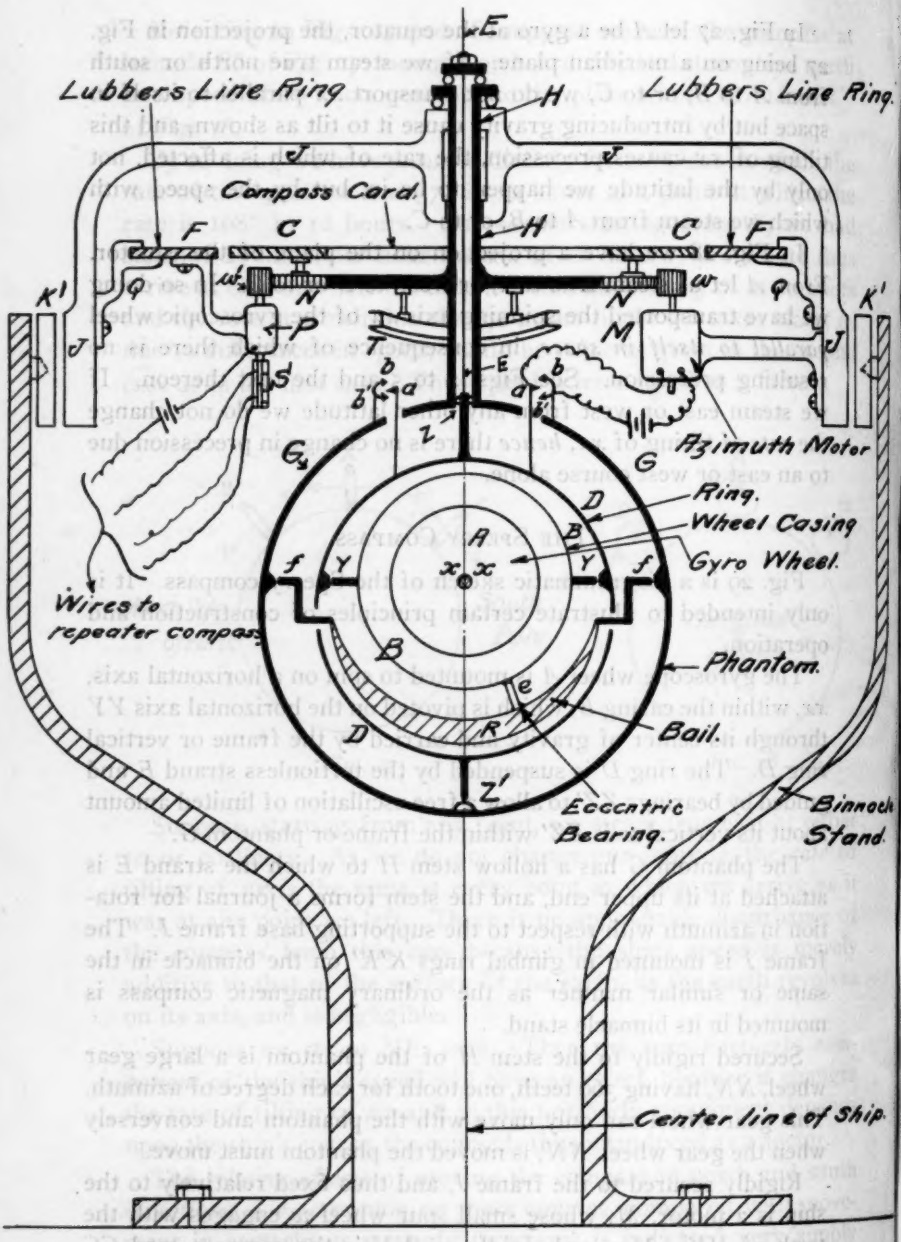

FIG. 29.—Partial diagram of section in an east and west line illustrating mounting and the follow up system.

is a flat ring, *FF*, on which is engraved the lubber's line. *FF* is supported by brackets, *QQ*, on the frame *J*. Rigidly secured to the lubber's ring, *FF*, is a transmitter *P* whose function is to transmit electrically to the repeater compass at the helmsman, or to the pelorus repeaters, any movement made by the compass card *CC*.

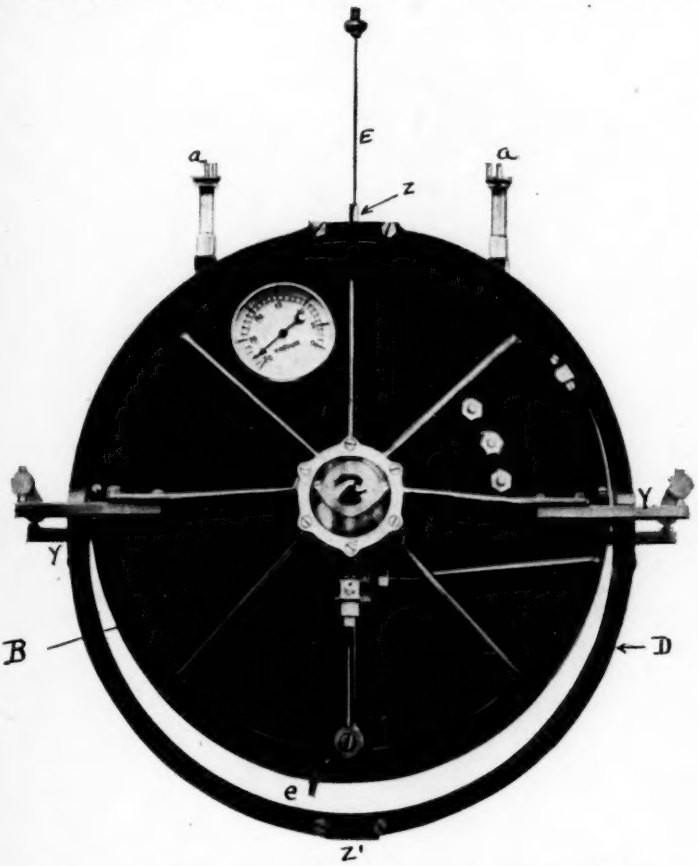

FIG. 30.—Wheel Casing and Vertical Supporting Ring, North End.

The wheel *A* together with the wheel casing *B* and the ring *D* is called the *sensitive element*. As a matter of fact, and most important, the sensitive element is the real gyroscopic compass, and all the other mechanism is installed simply to reproduce the exact movement, headings, or readings of the sensitive element in azimuth without interfering with it. Attached to the sensitive ele-

ment, on the vertical posts, *a, a,* as shown, are two electrical trolley contacts, *a, a,* which make a light electrical contact with double stationary contacts *bb', bb'* carried by the phantom. The object of this mechanism is to make the phantom carrying the compass

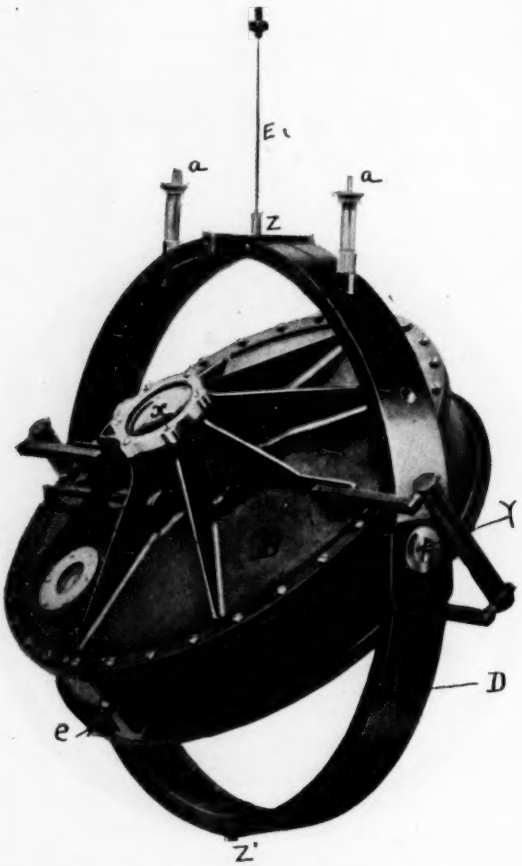

FIG. 31.—Wheel Casing and Vertical Supporting Ring, East Side.

card follow *exactly* every movement in azimuth of the axis of the gyro wheel and thus register in degrees either the heading (course) of the ship or the direction in which the gyro axis, *xx,* is pointing relative to the meridian. Furthermore, this movement, by means of the repeating transmitter, *P,* is sent to every steering

compass, bridge pelorus, and repeater compass in the ship. This work is performed without any interference with the freedom of action of the sensitive element except that of the very light touch of the electrical contacts *aa* and *bb' bb'*.

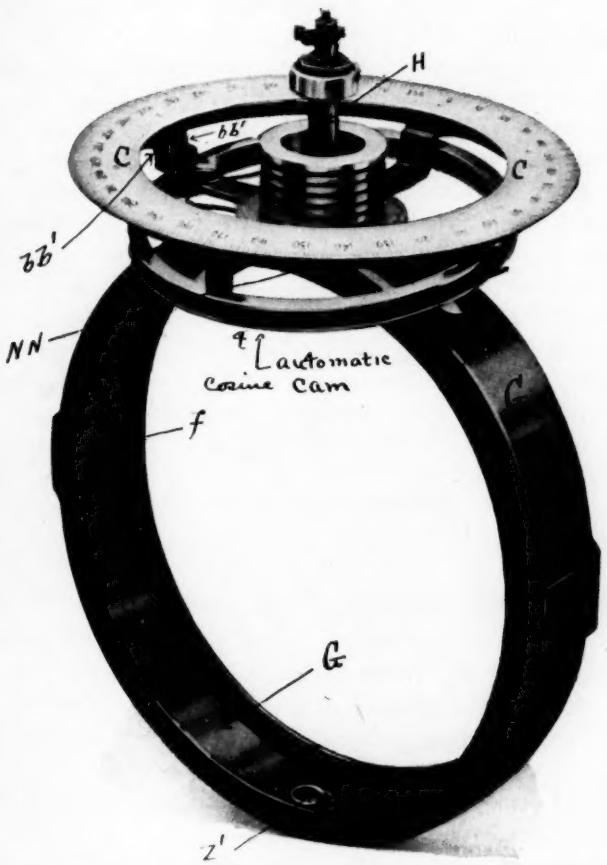

FIG. 32.—Phantom Card, Azimuth Gear and Cam for automatic Correction Mechanism.

Illustrations of the sensitive element and phantom are shown in Figs. 30, 31 and 32. Compare them with Fig. 29.

The method of operation follows:

Referring to Fig. 29, let us assume that the compass has been shut down and stopped for several days, that the ship is tied up to the dock and is stationary, heading say SE. and that the sensitive

element has stopped so that its axis happens to be pointing in the direction of the keel line, SE. and NW., which is perpendicular to the plane of the paper upon which Fig. 29 is drawn. Now start the up compass. As the wheel *A* gathers speed, it will tend to move out of the plane of the paper upon which Fig. 29 is drawn and the axis, *xx*, will tend to turn into the meridian to point north and south, carrying with it the sensitive element. As the sensitive element moves in azimuth to seek the meridian the contacts *aa* come in touch with the contacts *bb' bb'* and send current through the azimuth motor *M* which in turn rotates *NN* (and the phantom and compass card) through exactly the same number of degrees in azimuth through which *xx* has turned. In other words the compass card is forced to register exactly the movement in azimuth of the gyroscopic wheel.

As *NN* is revolved by *M* it turns the spur wheel *w'* of the repeater transmitter *P*. This wheel carries a commutator or contact maker *S* which energizes the motors of the compass cards of each and every repeater compass in the ship and makes them, too, register exactly as the compass card, *CC*, of the master compass shown in Fig. 29.

The conception and construction of this "follow up" and repeating system is very pretty.

THE AUTOMATIC CORRECTION SYSTEM

Fig. 33 is a diagrammatic sketch of this mechanism. In studying this figure it must be borne in mind that it is a sketch made solely for the purpose of illustrating principles and is not a mechanical drawing of a machine. It merely illustrates how the operations may be carried on but does not show the exact mechanical details of the construction. In Fig. 33 and in Fig. 29 the same parts have the same letters.

As stated previously in these notes, the gyroscopic compass on moving ships does not point north as has been supposed, but constantly requires the introduction of some three positive, or negative, correction factors before one can ascertain the true location of the meridian. While on land a gyro compass will point to the absolute north, yet when mounted upon a moving body, as a ship, which has a northerly or southerly course, or component of course, the gyroscope no longer receives simple easterly motion (from the earth's rotation) but a mixed motion, and is accord-

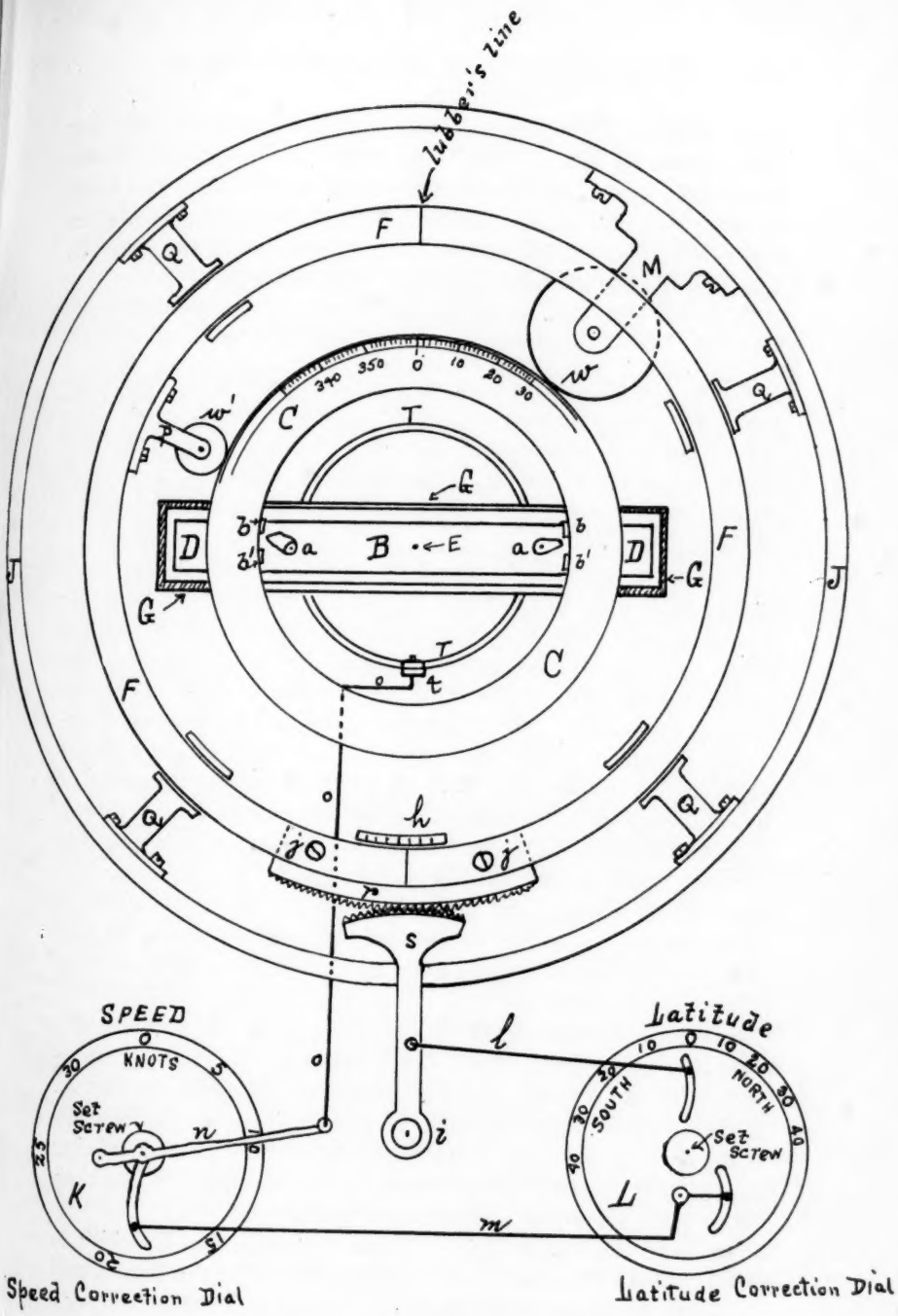

FIG. 33.—Diagram of Automatic Correction Mechanism.

ingly deflected from the meridian to correspond with the new relative axis in space. The amount of this deflection depends upon three variables, namely, the course of the ship, the speed upon such course and the latitude. The latitude also introduces a second correction, due to certain characteristics of the compass. The formula for the total deflection is as follows:

$$D = \frac{aK \cos H}{\cos L} - b \tan L.$$

Where D = total correction for the deflection of the gyro compass from true geographical north; H = ship's heading or direction of travel on course figured in degrees from the geographical north; K = speed in knots; L = latitude; and a and b are constant reduction factors for the units employed and certain dimensions of the instrument.

Heretofore it has been necessary to make simultaneous readings of these three independent factors and compute the total correction, or else consult elaborate printed tables to determine the positive or negative correction necessary, in some cases to make various adjustments by the addition or removal of weights with changes of latitude. Mr. Sperry has produced an automatic correction apparatus which constitutes a simple part of the compass structure, by means of which all of the above components of deflection and exactly compensated for and automatically entered, so that all readings of the master compass, together with repeating compasses and other auxiliary apparatus are always held dead upon the meridian. The indication of each repeater located at remote parts of the ship is always held true and found to read exactly upon the sun without any of the troublesome correcting factors mentioned above.

In Fig. 33, the compass card *CC*, the phantom *G*, sensitive element *BD*, lubber's line ring *FF*, azimuth motor *M*, repeater transmitter *Pw'*, etc., are all shown, lettered and indicated as in Fig. 29.

Referring to Fig. 33, the lubber's line ring, *FF*, carries a small-toothed rack *r*, engaging in the teeth of the arm *s*, the arm *s* being pivoted at *i*. Rotation of *s* around *i* causes the lubber's line ring, *FF*, to slide around in its bearings *QQQQ*.

An arm *l* connects *s* to the latitude correction dial *L*, which in turn is connected to the speed correction dial *K* by the arm *m*, and *K* in turn is connected by the arms *n* and *o* to a roller bearing *t* which engages in the slot of the cosine cam *T*. (See also Fig. 29.)

It will be seen that this construction is in effect a system of link work such that as *t* moves in accordance with the guide slot of the cam *T*, its motion is transmitted through *o*, *n*, *m*, *l*, *s* and *r* to the lubber's line ring, *FF*, and moves it to the right or left by an amount which is necessary to make the desired correction. The cosine cam *T* is designed to correct for the course of the ship, *i. e.*, when the ship changes her heading (or course) *T* automatically introduces that correction referred to where it stated "thus the course is introduced as a factor." When *FF* is moved by *s*, the repeating transmitter wheel *w'* rolls around *CC* which remains fixed, and thus each repeater compass in the ship is made to read exactly as the master compass. For example, if the lubber's line were moved 3° to the right of its position of 0° as shown in Fig. 33, the course by the master compass would then read N. 3° E. But while *FF* moved to the right 3° it would carry the repeater wheel *w'* with in and cause *w'* to roll around on *CC* and this movement of 3° would thus be electrically transmitted to, and simultaneously, registered on every repeater compass in the ship so that they, too, would read N. 3° E. exactly the same as the master compass.

The cosine cam *T* thus regulates the amount the lubber's line is moved to correct the error introduced by the ship steaming on any course between north and south, east and west.

For any specific course, the amount of correction introduced by the link work *l*, *m*, *n*, *o* will be always the same, provided the length and relative positions of the link work arms *l*, *m*, *n*, etc., remain unchanged.

The speed correction dials *K*, and the latitude correction dial *L* are a complicated series of disc cams, so constructed that by loosening up the set screws on either dial the proportional arrangement of the arms of the link work system connected to that dial may be altered *without changing the relative effect of the link arms attached to the other dial.* (The diagram does not show the mechanical details of this construction.)

Thus, to set the latitude dial so as to introduce its correction, slack up on the latitude dial set screw, turn the dial *L* to the proper latitude reading and then clamp the set screw again. The link work system now has the latitude correction combined with the course correction. To add the speed correction to the foregoing, slack up the set screw on the speed correction dial, *K*, turn this

dial until it is set for the speed at which the ship is steaming, then clamp the set screw. The proportion of the arms of the link work system have now been so adjusted that the corrections for speed is automatically added to that for the latitude and course, and the

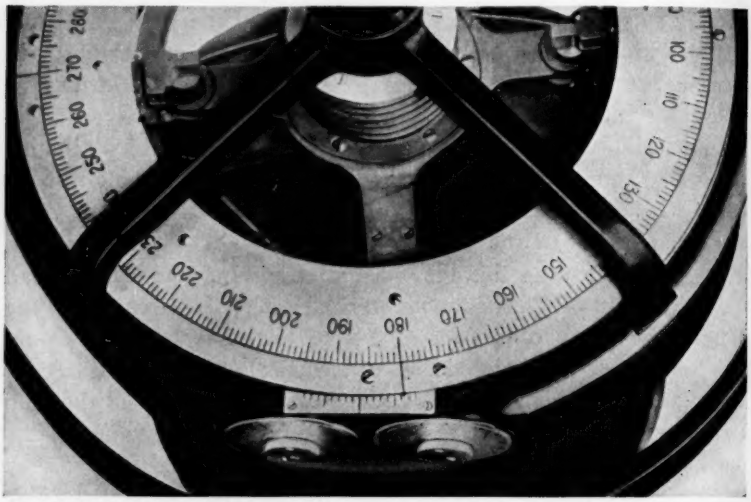

FIG. 34.—Portion of Master Compass Card, Showing Exact Meridianal Course, also the Amount of Correction being Automatically Introduced at the Moment.

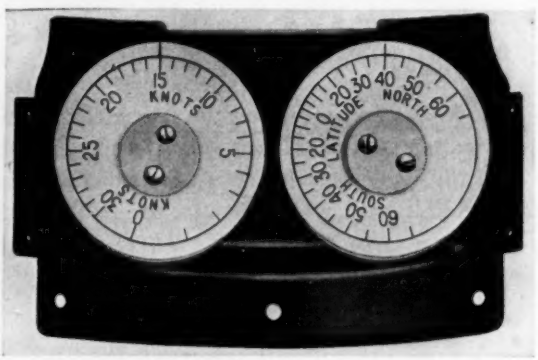

FIG. 35

lubber's line indicates, on the master compass card *CC*, the exact true course the ship is steering and all other repeater compasses in the ship indicate the same course as the master compass. See Fig. 34.

Fig. 35 shows a setting for 15 knots speed in latitude 40° N.

As the factor introduced by the cosine cam *T* is constant, this cam is so designed that when once installed no further adjustment of the cam itself is necessary.

When the compass is running normally and the dials are set for the correct latitude and speed there should be no error and this should be shown by the fact that true bearings or azimuths of the sun as observed by an azimuth circle on a repeater should be the same as the true bearing of the sun worked out by the azimuth tables. If these agree exactly there is no error in the compass and all bearings taken, or courses steered, by it are *true*.

If azimuths of the sun indicate an error in the compass in spite of the fact that the dials are correctly set for the correct speed and

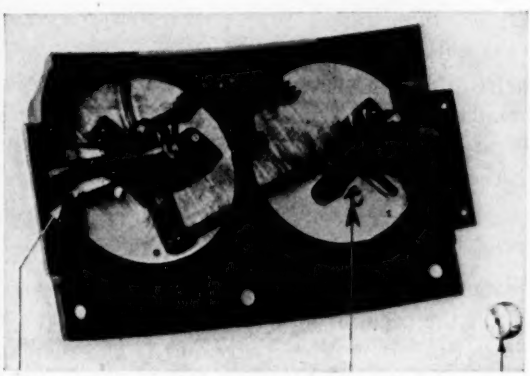

FIG. 35A.—Cosine cam engages here.

latitude, the presence of such an error indicates one of two things, viz.: (1) The presence of an oscillation, during which the error passes slowly to a maximum easterly error, then back to a corresponding maximum westerly error, and so continues for some time until the oscillation subsides; or (2) The compass may have changed its *settling point* so that it has a *constant* easterly, or westerly, error.

To Correct a Constant Error.—Loosen the small set screws *jj* (Fig. 33) found on each side of the lubber's line aft. Loosening these screws allows the lubber's line ring to be turned independently of the short rack *r* driven by *s*. By means of the thumb and forefinger of each hand, turn *FF* through the number of degrees measured on the scale *h* (Fig. 33) as an azimuth of the sun has shown the compass to be in error, then clamp or set up tightly on

jj. Now if the dials are correctly set for speed and latitude the master compass and all repeaters should show no error, by observation of the sun, under all conditions of service.

TO DETERMINE IF THE COMPASS HAS AN OSCILLATION

The period of the compass, *i. e.*, the time it takes to make one complete oscillation varies from 70 to 80 minutes, hence observations of the sun, or Polaris, for azimuth, taken every 10 or 15 minutes apart, extending over a period of 70 to 80 minutes, will show whether the compass is oscillating and, if so, the amount of such oscillation.

Or if the sea is calm and smooth, 10- to 15-minute comparisons of the ship's head per gyro compass with that per standard magnetic compass will disclose the oscillation.

Or if the ship is at rest, as at anchor in a smooth harbor, and no sun is available, the rise and fall of the axis due to an oscillation is indicated by the travel of the bubble in the spirit levels attached to the compass.

A QUERY

To the reader not quite familiar with the principles of operation of the compass the thought may arise that the lubber's line on *FF* has been indiscriminately moved around *CC* and then said to give a true reading. How can this be so? The keel of the ship has not changed! The lubber's line on the steering compass and pelorus dials on the bridge are absolutely fixed and installed parallel to the keel of the ship and cannot be changed, yet you are constantly shifting the lubber's line on the master compass and say this gives true courses and bearings on the bridge! How can this be so?

The answer is simply this: The compass cards of each and every repeater compass are controlled and moved by the lubber's line ring *FF*. They move with *it* and not with the compass card *CC* of the master compass. The compass card of the master compass by virtue of its association and connection with the sensitive element, serves as a scale upon which to indicate the true bearing of the meridian. Hence, if we move the lubber's line, *FF*, around *CC* to a point reading, say, 346° on *CC*, then each repeater compass *card* will move around to register 346° by the fixed lubbers'

(keel) lines on the bridge compass, and will show the ship to be steaming a true course of 346°. If 346° be not the course to be steered to reach port, then the keel of the ship *is* altered by the rudder to such a course as will bring her to the desired destination.

In other words, in the master compass we have the lubber's line travel around the master compass card, but in the repeater compass the card travels around under the lubber's line. As the movement in azimuth is identical in each case, each compass will read the same number of degrees.

ROLLING AND PITCHING

All of the foregoing notes upon the principle of operation of this compass have referred (1) to a compass mounted on shore and (2) to a compass mounted on board a ship moving in a *smooth, calm* sea.

When the ship rolls and pitches, new forces and conditions arise. The forces due to the rolling and pitching of the ship may be resolved into two components; (1) the accelerating forces due to reversal of direction, and, (2) centrifugal forces due to the fact that the parts of the compass have an angular motion in addition to the motion of translation.

In the Sperry compass the effect of the acceleration forces on the compass is overcome by means of the stabilizer gyro shown in Figs. 36 and 36a while the centrifugal forces are overcome by means of the compensating weights shown in Figs. 36a and 36b.

The Sperry compass in service aboard the *Montana* gave us great comfort and satisfaction and we relied upon it. We considered it a wonderful instrument and one of the most valuable additions of modern science to the sea-going world. In the conning-tower, and below decks, its freedom from magnetic influence is most valuable.

It requires for its proper functioning the *intelligent* care and supervision of officers and electricians who *know how* to run it, but it did not require greater specialization along its particular lines than did guns, torpedoes, chronometers or any other mechanical devices installed in a modern ship.

I have only praise for it. Like everything else, though, success with it depends upon intelligent care and operation.

FIG. 36.—Floating Ballistic or Stabilizer.

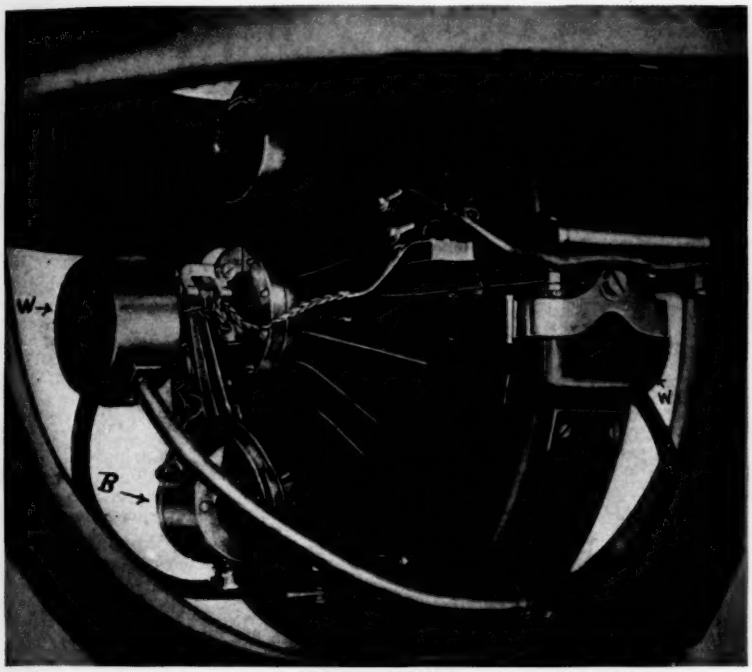

FIG. 36A.—Master Compass, North West Elevation; Showing Stabilizer or Floating Ballistic *B*, and compensating weight *WW*.

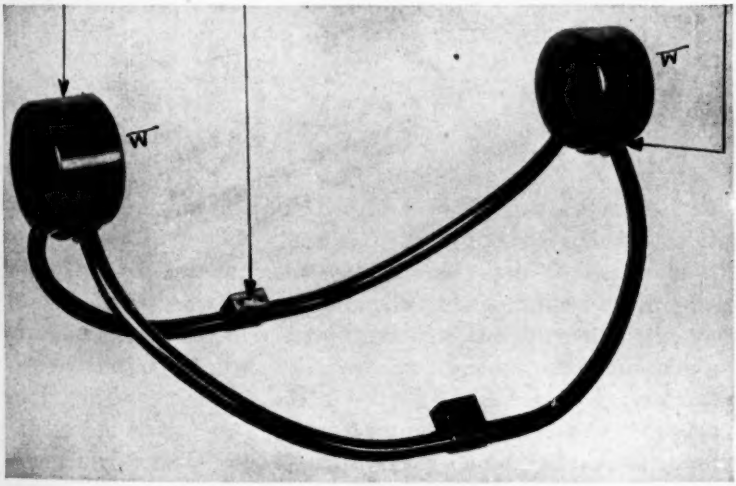

FIG. 36B.—Compensator Weight and Frame.

APPENDIX

The following explanation of the deviations due to accelerating and centrifugal forces and their correction is by Mr. Harry L. Tanner, engineer of the Sperry Gyroscope Company, to whom acknowledgment is here made:

COMPASS DEVIATIONS DUE TO ACCELERATION FORCES

The compass wheel, wheel case and bail may be represented diagrammatically by a rotating disk *A*, Fig. 37, rotating on bear-

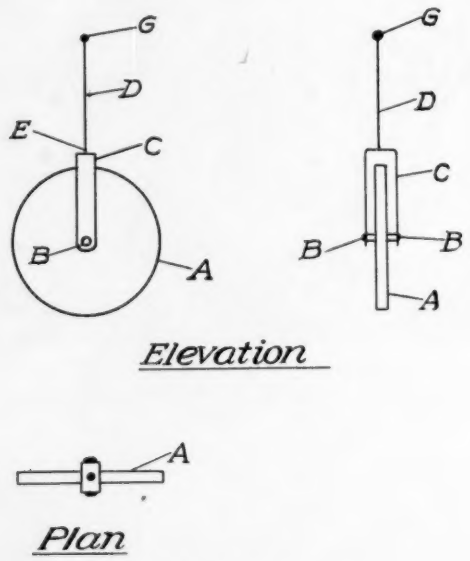

FIG. 37

ings *B* in a U-shaped frame *C*, which is in turn suspended by means of a flexible cord *D*.

The ballistic factor of the compass is represented by the weight of the disk *A*, multiplied by the distance from center of the disk to point *E* when flexible cord *D* is attached to frame *C*.

Now suppose, for instance, that the compass be accelerated alternately NE. and SW., Fig. 38. The whole compass will act as a pendulum and will take up a position such that the cord *D* will be parallel to the line of the force *F*, which is the resultant of the acceleration force and gravity.

The frame C will respond to the $EW.$ component of this force, but not to the $NS.$ component on account of being stabilized in this direction by the disk A.

Let a, shown in projection in Fig. 38 as a', represent the angle between force F and the horizontal plane, then the horizontal component of F will be $F \cos a$. When the acceleration force is NE. the $NS.$ component of this force will produce a torque about xy,

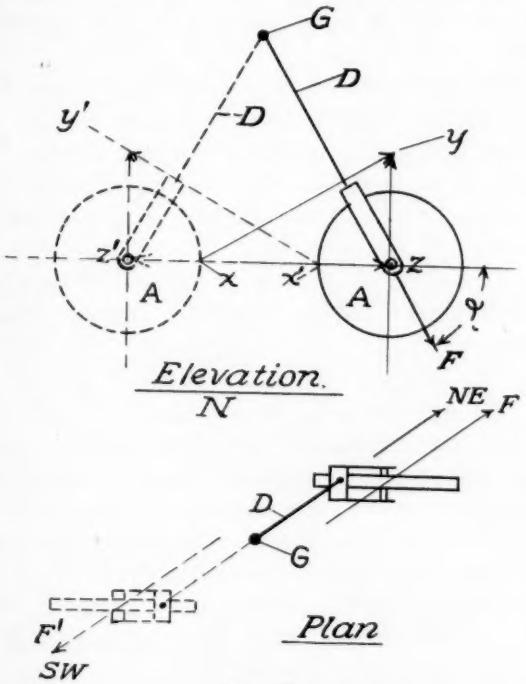

FIG. 38

which lies in the plane of the disk. This torque may be resolved into a component about the vertical axis zy and a component about the horizontal xz. Similarly, when the acceleration force is SW. the arrows $z'y'$ and $x'z'$ represent components of torque about the vertical and horizontal axes respectively. It will be seen that the torques about xz and $x'z'$ are equal and opposite and therefore cancel, but that the torque about zy and $z'y'$ are in the same direction and therefore add, giving a torque about the vertical axis of the disk which, acting through a cycle of precessions, will cause a movement of the disk in the direction of the torque.

Similarly, it may be shown that alternate NW. and SE. accelerations will produce a torque in the opposite direction about the vertical axis.

As the direction of the acceleration pressures approaches the *EW.* line it is evident that the *NS.* component of the force $F \cos \alpha$ will approach zero and as the acceleration pressures approach the *NS.* line, the lever arm of these forces about the vertical axis will approach zero, in either case resulting in zero torque about the vertical axis.

As explained, the compass deviations, due to accelerating forces, are due to the fact that the force and lever arm reverse at the same instant, giving a torque in a constant direction about the vertical axis of the compass. By reducing either of these components to zero or making the direction of either constant while the other changes, we shall have either zero torque about the vertical axis or equal positive and negative torques, which would give a resultant zero torque. The latter method is made use of in the compass.

As all of the forces acting upon the wheel in the compass are introduced through the bail, it is only necessary to hold the point of connection between the bail and wheel case fixed with respect to a vertical line passing through the center of the wheel. As far as the effect of the acceleration force goes, it makes no difference what this position is so long as it is fixed, but to secure damping it is nearly one-fourth inch to the east of the center of the wheel.

Referring to Figs. 39 and 40 it will be noted that the stabilizer is mounted on the north side of the compass wheel case, the bearings at point *A* leaving it free to swing about an axis parallel to that about which the main compass wheel spins.

The small gyroscope, *B*, spins upon an EW. axis and is free to precess about a vertical axis, the bearings being shown at *CC*.

Due to the stabilizing effect of the gyroscope *B*, the frame *D* will be held in a fixed relation to a vertical line passing through the center of the main compass wheel, and the small rollers, *EE*, are therefore held a fixed distance from a plane passing through the axis of the main wheel. These rollers run in tracks, *F*, attached to the wheel case and *G* attached to the bail.

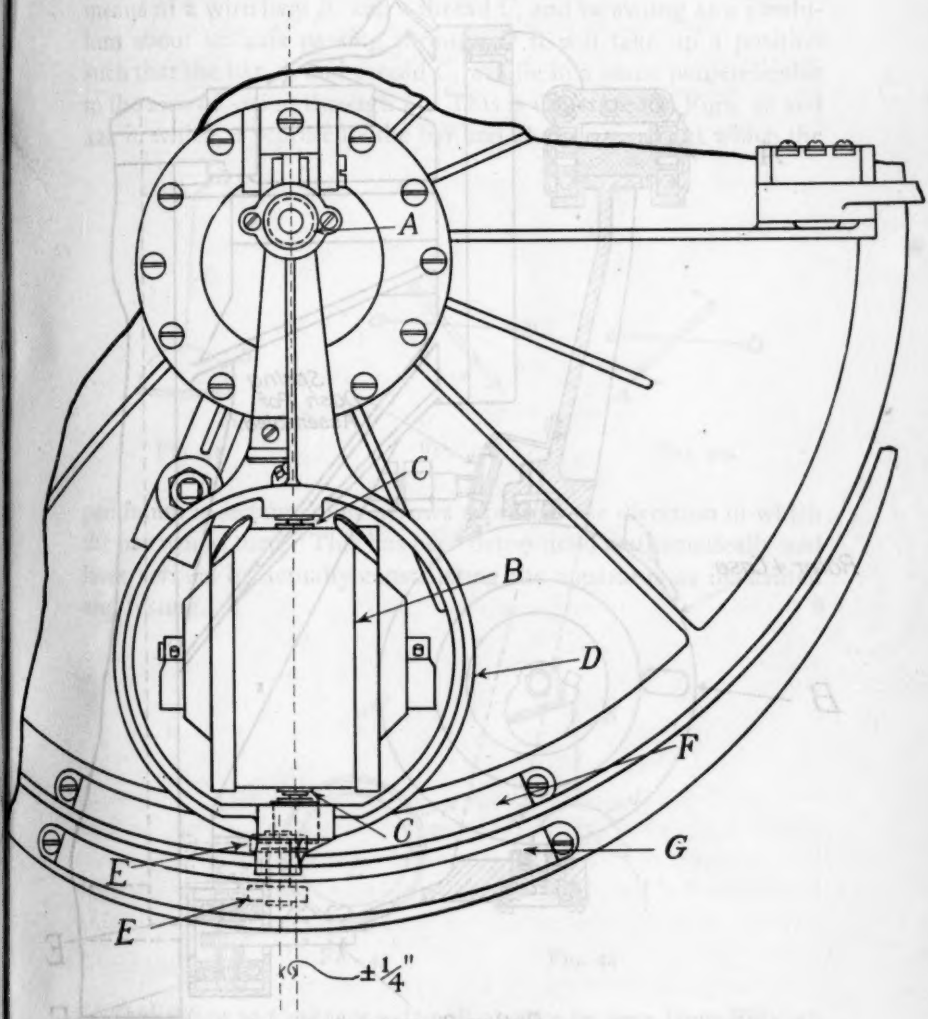

FIG. 39

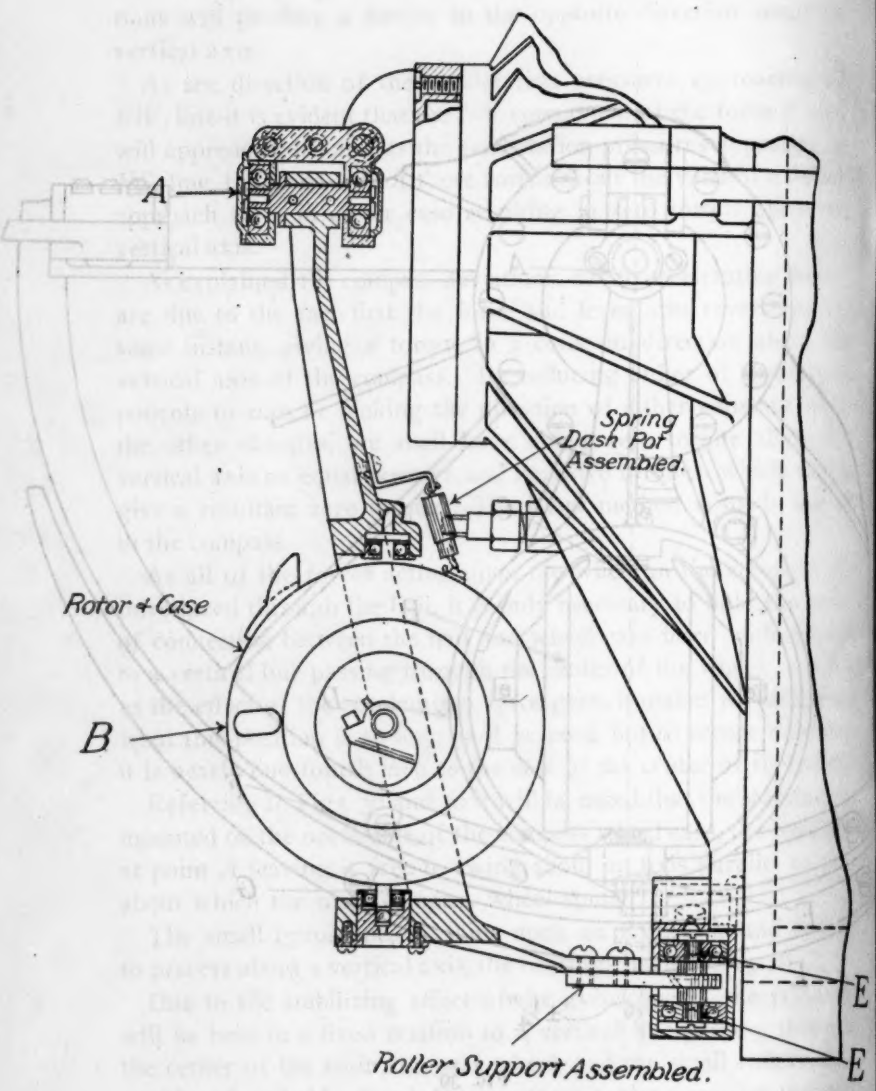
A
Spring
Dash Pot
Assembled.
Rotor + Case
B
E
E
Roller Support Assembled.

FIG. 40

COMPASS DEVIATIONS DUE TO CENTRIFUGAL FORCE

Cause of Deviations.—If a bar *A*, Fig. 41, be suspended by means of a wire loop *B*, and a thread *C*, and be swung as a pendulum about an axis passing through *D* it will take up a position such that the bar *A*, and thread *C*, will lie in a plane perpendicular to the axis of swing through *D*. This is illustrated in Figs. 42 and 42a in which *A* represents the bar and *ab* the axis about which the

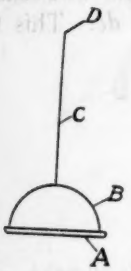

FIG. 41

FIG. 42

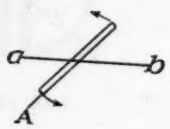

FIG. 42a

pendulum is swung. The arrows represent the direction in which the bar would turn. This has been determined mathematically and later verified by actually constructing the apparatus as illustrated and testing.

FIG. 43

FIG. 44

Application to Compass.—It will at once be seen from Figs. 43 and 44 that the vertical ring, wheel case and stator of the compass, *i. e.*, the entire sensitive element with the exception of the rotor (which does not enter in any way on account of being free to turn on its bearings about an axis perpendicular to the plane of the paper and being stabilized about an axis passing through the

horizontal bearings of the case) may be replaced by a weightless rod *H*, a weightless support *J* and thread *K* and two weights *I, I*.

Theory.—Fig. 45 shows the apparatus of Fig. 41 swinging about an axis which makes an angle of about 45° with the bar *A*. It is evident that any point in the bar will swing in a plane perpendicular to the axis *ab* and in the arc of a circle of which the center lies in the axis *ab*. Thus the particle *c* would move in an arc of a circle of radius *cd* and in a plane perpendicular to *ab*. The centrifugal force then would be directed along the line *dc*. This force

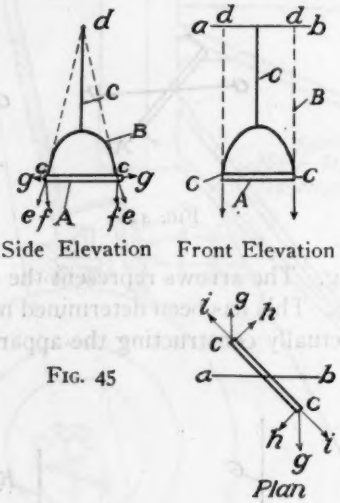

FIG. 45

can be resolved, as shown, into components *cf* and *cg*. Then *cg* can be again resolved into components *ch* and *ci*. It will be seen that all components such as *ci* have no effect other than to produce tension in the bar *A* but that all components such as *ch* produce a couple tending to rotate the bar toward a position perpendicular to *ab*.

Remedy.—From Figs. 42 and 42a it will be seen that two like bars which are 90° apart have equal torques in opposite directions. Therefore, if we should fasten two of these bars together the forces would exactly neutralize each other. This would be true when the cross is placed in any position so long as the bars are at right angles to each other, as the torque is proportional to the product of the sine and cosine of the angle with the axis of

swing so comes up to a maximum at 45° and drops to zero at 0° or 90°.

It will be evident from Fig. 46 (or Fig. 46a) that the effect of the crossed bars may be secured in the compass by attaching

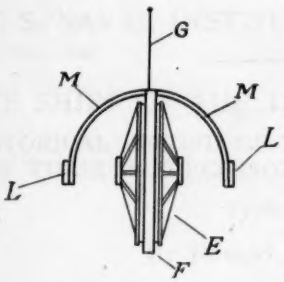

FIG. 46

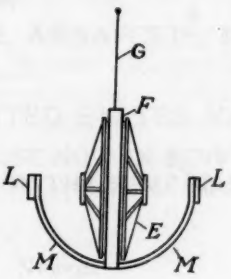

FIG. 46a

arms *MM* to the north and south sides of the vertical ring and attaching weights *LL* to them at points in line with the center of the wheel. These weights must be attached to the vertical ring as they would have no effect if attached to the stabilized case. See Figures 36a and 36b.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE SHIPS OF THE UNITED STATES NAVY

AN HISTORICAL RECORD OF THOSE NOW IN SERVICE AND OF THEIR PREDECESSORS OF THE SAME NAME

1776-1915

By ROBERT W. NEESER

UTAH

UTAH.—One of the United States, which takes its name from an Indian tribe known as the Utes or Yutas, whose hunting grounds embraced three-fourths of the territory enclosed by the present boundaries. By the treaty of Guadalupe-Hidalgo, signed in 1848, Utah came under the territorial jurisdiction of the United States, and in 1896 was admitted to the Union.

The *Utah* is a battleship of the first class, laid down on November 24, 1908, and launched from the ways of the New York Shipbuilding Company on December 23, 1909. Her over-all dimensions are 521 feet 6 inches length and 88 feet 3 inches breadth, with a mean draft of 28 feet 6 inches. Her displacement, on this draft, is 21,825 tons. She carries 2500 tons of coal and 400 of fuel oil. The machinery installation of the *Utah* consists of Parsons 4-screw steam turbines and Babcock and Wilcox water-tube boilers, together with the usual auxiliary machinery. While running at full speed the revolutions per minute of the turbines are about 330, and the horse-power developed is about 28,000, which, on her trial trip, enabled her to exceed her required speed of 20.75 knots.

Like her sister ship, the *Florida,* the *Utah* carries a battery of ten 12-inch rifles mounted in pairs in balanced turrets. All of the guns being placed on the center-line, they can all be trained on either broadside, while dead ahead or astern four guns can be fired. The secondary battery consists of sixteen 50-caliber 5-inch guns, eight of which are carried on the gun-deck within a central battery, four aft on the same deck, and four forward on the main deck.

The *Utah* also has two submerged torpedo tubes, four 3-pounders, two saluting guns, two field pieces, and two machine guns.

For the protection of her hull, the ship has a main belt, 8 feet wide, of 11-inch steel, above which is a second belt 9 inches in thickness. The turrets have 12 to 8 inches of protection, while the secondary battery amidships is shielded by 6½ inches of armor. The *Utah* was authorized by the Act of Congress approved May 13, 1908, and she was laid down at Camden, N. J., on March 15, 1909. She has two smokestacks and two fire-control masts, and carries a complement of 60 officers and 888 men.

The *Utah* went into commission at the Philadelphia navy yard on August 31, 1911, and nine days later proceeded to New York to complete her installations. She was in command of Captain William S. Benson. Her first duty was with the Atlantic fleet during the annual mobilization and review, after which she made her shaking down cruise and her final acceptance trials. In March, 1912, she was assigned to the Atlantic fleet, and for a year she participated in the usual maneuvers, target practices, and evolutions, until March 31, 1913, when she proceeded to the New York navy yard for her regular overhaul period.

On June 25, 1913, Captain Benson was relieved by Captain Louis S. Van Duzer, who continued in command of the *Utah* until April 8, 1914. In the meantime, in obedience to urgent orders, the ship had been detached from the fleet and sent to Vera Cruz, where she arrived on February 16, in company with the *Florida,* for the protection of American interests. From April 10 to April 15, the *Utah* was off the Panuco River receiving on board refugees from Tampico, but on the 16th the ship was hurried back to Vera Cruz, where, on the 21st, her landing force was sent ashore to reinforce the *Florida's* battalion and the marines who, earlier in the day, had taken possession of the custom house and cable office. With the arrival of the Atlantic fleet on the scene, the occupation of Vera Cruz was then completed. All this time the *Utah* was in charge of her executive officer, Commander Cone, until Captain John H. Gibbons could reach Vera Cruz and assume command (April 22, 1914).

From this date on followed weary weeks of watchful waiting. Then, on June 15, the *Utah* received orders to return north for overhaul, and on the 23d she arrived at New York. On July 2, when Captain Gibbons left the ship, Commander F. H. Clark took

command, and he in turn was succeeded by Captain Albert Gleaves (September 29, 1914,), under whom the *Utah* continued with the Atlantic fleet.

FLORIDA

FLORIDA.—The southernmost state of the United States on the Atlantic coast, and so named by Ponce de Leon because he discovered it on Easter Day (Pascua florida). It was settled by the Spaniards in 1513 and 1565, and by Huguenots in 1562. In 1763 it was ceded to England, then to Spain in 1783, and finally to the United States in 1819. Florida was admitted to the Union in 1845.

The battleship *Florida* is the fourth ship to bear the name of the Peninsula State. She was authorized by Act of Congress approved May 13, 1908, and laid down at the New York navy yard on March 9, 1909. Her displacement is 21,825 tons and her dimensions are as follows: length over all, 521 feet 6 inches; breadth, 88 feet 3 inches; and draft, 28 feet 6 inches, when carrying a full supply of ammunition and a two-thirds supply of fuel and stores. She is equipped with four-screw turbines of the Parsons type, with the usual auxiliary machinery, for which steam is furnished by 12 Babcock and Wilcox boilers. Her bunker capacity is 2500 tons of coal, besides 400 tons of oil fuel, and her speed, on trial, was 22.54 knots.

The armament of the *Florida* consists of ten 12-inch B. L. R.'s and sixteen 5-inch R. F.'s. In addition she has two saluting guns, four boat guns, two field guns, and several machine guns. She has also two submerged 21-inch torpedo tubes. The armor protection given to the battery, when designed, was considered the most effective and complete yet put on any ship. The main belt of 11 inches of steel was supplemented by a second 8-foot-wide belt of 9 inches. The turrets were given from 12 to 8 inches of armor, while the 5-inch guns were protected by 6½ inches, with 2-inch splinter bulkheads between the guns.

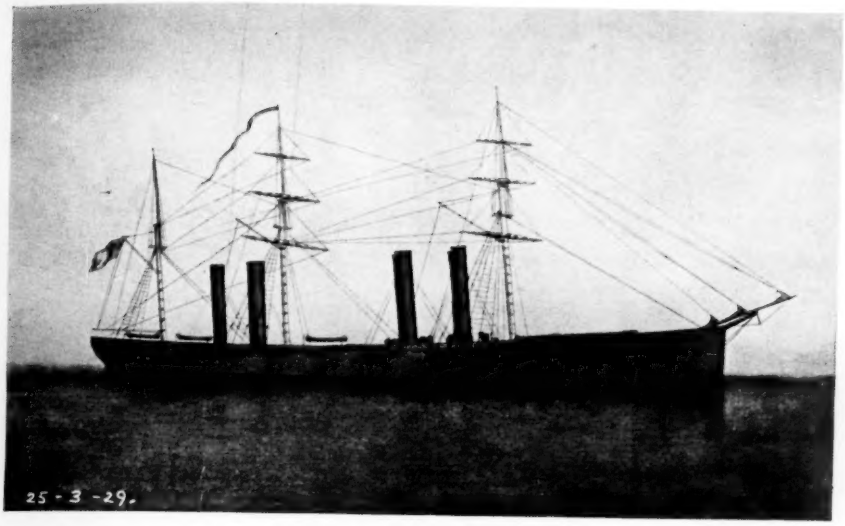
In outward appearance, the *Florida* resembles her sister ship, the *Utah*. She has two smokestacks, two fire-control masts, and five turrets mounted on the center-line of the ship. Her contract cost was $6,000,000, and her complement, as flagship, is 60 officers and 888 men.

The *Florida* was placed in commission at New York on September 15, 1911, and left the yard towards the close of October in command of Captain Harry S. Knapp. After various preliminary

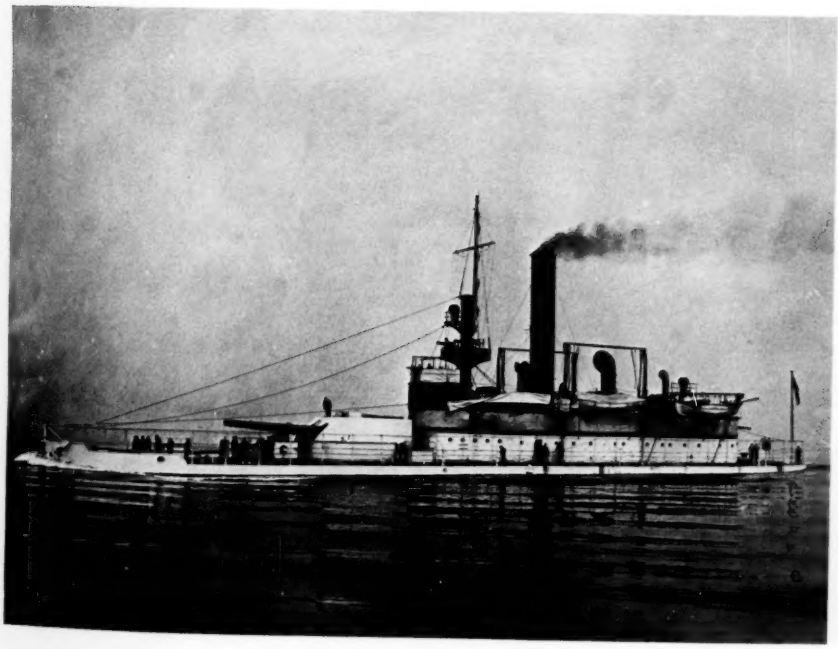
trials and cruises, she joined the Atlantic fleet on March 31, 1915, with which she continued until October 17, when she returned to the navy yard for docking. Several days later, Captain William J. Maxwell relieved Captain Knapp (October 24, 1912), and on November 7 the *Florida* rejoined the fleet to participate in the regular work and routine. For the next 12 months the ship was continuously in commission. Then, in December, 1913, she returned to New York, where Captain William R. Rush took command on December 22, 1913. Sailing on January 5, 1914, the *Florida* rejoined the Atlantic fleet, as flagship of the first division, at Hampton Roads, and then proceeded to Porto Rico and to Guacanayabo Bay for the usual winter maneuvers. But in the midst of this routine work orders came for the *Florida* to proceed to Vera Cruz, Mexico, for the protection of American interests. This was on February 13. Two months later the *Florida* was still at Vera Cruz; then came the order from Washington to land and sieze the custom house. The *Florida's* battalion was instantly landed under the command of Captain Rush, in co-operation with the marines from the *Prairie,* after which reinforcements were received from the *Utah* and from the landing parties of the other ships of the fleet which arrived early in the morning of the 22d. The occupation of the entire city then became possible. For a week the bluejackets maintained order in the city, until, with the arrival of the troops under General Funston, the army assumed charge of the affairs on shore. After this many weeks of inaction followed, but early in July orders were finally received to proceed north and the *Florida* immediately got under way, headed for New York, where she arrived on July 19.

During the month of August, owing to the outbreak of the European war, the *Florida* was engaged in maintaining our neutrality in New York harbor. Then followed a few weeks of target practice, and on September 20 a well-earned rest for overhaul and repairs at the navy yard. When the *Florida* again left the yard, on January 8, 1915, she was in command of Captain Hilary P. Jones (December 21, 1914), and was attached to the second division of the Atlantic fleet.

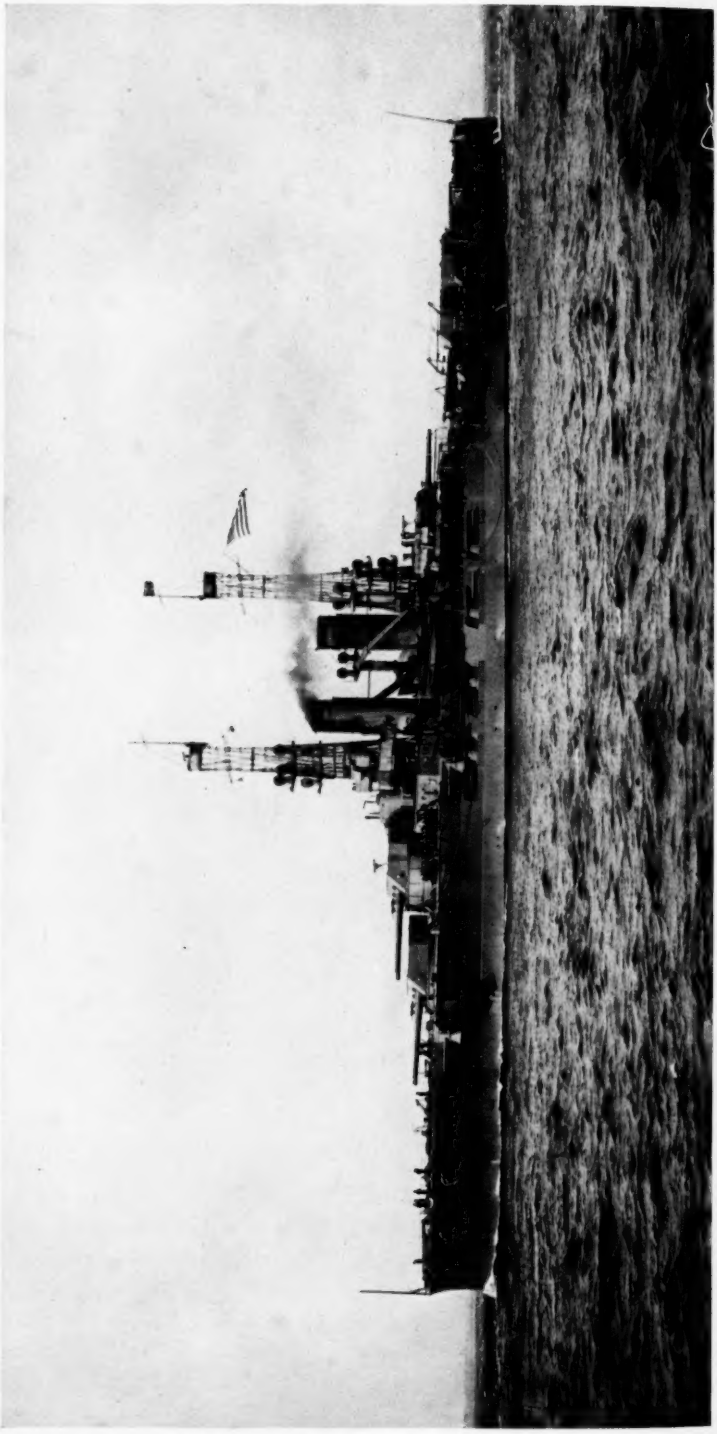
The third *Florida,* still in service, but now known as the *Tallahassee,* is one of the class of vessels authorized by Congress on May 4, 1898, and was built at the shipyard of Lewis Nixon, in



U. S. S. "FLORIDA," 1869



"FLORIDA" (MONITOR) NOW "TALLAHASSEE"



U. S. S. "Florida"

Elizabethport, N. J., where she was launched on November 30, 1900. The *Florida* is a steel-armored vessel of 3225 tons displacement, with the following dimensions: length, 252 feet; breadth, 50 feet; draft, 12 feet 6 inches. Her engines are of the vertical triple-expansion type, for which steam is supplied by four Mosher boilers. She has a bunker capacity of 355 tons of coal, and her speed, on trial, was 12.40 knots. In 1903, when commissioned, the *Florida* was armed with two 12-inch B. L. R.'s mounted in a single turret forward, while in a superstructure were placed four 4-inch R. F.'s, three 6-pounders, six 1-pounder guns, and two Colt automatics. For the protection of this battery, there are from 10 to 9 inches of armor on the turret; and there is also a water-line belt varying from 11 to 5 inches, in addition to a protective deck of 1½ inches of steel. The *Florida* has one military mast and one funnel. Her complement is 13 officers and 209 men. The contract cost of her construction was $925,000.

When the *Florida* was commissioned, on June 18, 1903, by Commander John C. Fremont, she was attached to the coast squadron of Rear Admiral J. H. Sands, after which she was transferred to the North Atlantic fleet. So efficient did she and her sister ships prove, that the commander-in-chief, on July 1, 1904, wrote: "The new monitors are admirably adapted to the use for which they were designed. They have good speed, are easily and quickly maneuvered, and for the protection of large harbors, bays, and sounds, are invaluable."

After two summer cruises with the midshipmen of the Naval Academy, and duty with the fleet, the *Florida*, on September 23, 1905, arrived at the League Island navy yard, where, on October 10, Commander C. W. Bartlett relieved Commander Fremont. From November 11 until July, 1906, she formed part of the coast squadron of the Atlantic fleet. During the summer of 1906, under Commander Washington I. Chambers (July 27, 1906), the usual summer cruise took place, until September 11, 1906, when she was placed in reserve at Annapolis, Md., for experiments on her 12-inch turret. Commander James P. Parker assumed command on the termination of the 1907 summer cruise, and remained in charge until the vessel was placed out of commission on January 6, 1908. Then came the *Florida's* last cruise under her "maiden name." Commander John G. Quinby (May 21, 1908) was her commanding officer during that summer, after which, on her return to her

home port, she was placed out of commission at Norfolk, Va., and renamed the *Tallahassee* (June 19, 1908) so that the name *Florida* might be assigned to the new battleship recently authorized by Congress.

The screw steamer *Florida,* known until 1869 as the *Wampanoag,* was a wooden vessel of the first rate. She was built by the government at the New York navy yard at a cost of $1,575,643.84, and was launched on December 15, 1864. Her dimensions were as follows: tonnage (old), 2135 tons; displacement, 4215 tons; length 335 feet; breadth, 45 feet 2 inches; depth of hold, 16 feet; draft, 18 feet 6 inches. Her steam machinery was furnished by the Novelty Iron Works and consisted of a pair of horizontal-geared engines, for which steam was furnished by eight main and four superheating boilers. She had a bunker capacity of 550 tons of coal, and was fitted with four funnels. In October, 1867, her battery consisted of ten 9-inch smooth-bores, three 60-pounder rifles, two 24-pounder howitzers, and two 12-pounders. This armament, in 1874, was altered to comprise, in addition to the ten 9-inch guns, two rifled 100-pounder Parrott guns.

The *Florida* was a dismal failure. Owing to the acute shape of her hull, not a single gun on her gun-deck could be used in giving chase to an enemy ahead, nor could sufficient room be found to man her stern guns. Moreover, so "exorbitant" was her length, that a board of officers reported her unable to "endure rough seas without evincing sooner than common—and perhaps much sooner —a palpable want of longitudinal rigidity," and so difficult was she to maneuver that, in battle, she would have lost many valuable moments in bringing her battery to bear promptly on an antagonist. Her speed for that day was remarkable. On her trial trip, held on February 12, 1868, she actually made 17¾ knots. "All her boilers were brought into play," reads a report, "and, judging from the total amount of coal burnt, which was 137 tons during 24 hours, they were all probably urged to the uttermost. But this quality of a very high velocity under steam alone is really about all that has been established as to her merits as an efficient war vessel." In effect, nothing was spared to attain this single end, with the result that every other essential attribute of a man-of-war seems to have been sacrificed to secure it.

So the *Florida* never saw active service. From 1870 to 1875 she remained in ordinary at the New York navy yard, and then she was transferred to New London, Conn., where she was kept in the same condition until she was stricken from the Navy Register in 1883, and, two years later, was sold for $41,508.

The first *Florida* was a side-wheel steamer purchased by the government from S. L. Mitchell & Co., on August 12, 1861, for $87,500. She was a wooden vessel of 1261 tons, 214 feet length, 35 feet 3 inches breadth, and 22 feet 4 inches depth of hold. She was rated as a third rate, and had two decks and three masts. Her best speed was 12½ knots, and she was manned by 19 officers and 157 men. Her armament on October 6, 1861, consisted of eight 32-pounders and one 20-pounder Parrott rifle; but this battery was, in March, 1863, changed to four 9-pounder smooth-bores, one 100-pounder Parrott, one 50-pounder Dahlgren rifle, and one rifled 12-pounder.

The *Florida* went into commission at New York on October 5, 1861, and eleven days later, under the command of Commander J. R. Goldsborough, put to sea with the squadron of Flag Officer Du Pont. During the passage to Hilton Head, however, an accident was sustained by her machinery which compelled Commander Goldsborough to resort to the use of his sails and put into Philadelphia for repairs. The *Florida* consequently reached Port Royal only on the 13th of November, too late to participate in the attack upon Forts Walker and Beauregard. On the 16th, however, Commander Goldsborough was able to report a brief engagement with the *C. S. S. Everglade* and two other vessels of Commodore Tattnall's flotilla, after which Flag Officer Du Pont hoisted his flag on board the *Florida* during a reconnoissance of Tybee Island.

On November 29th, Commander Goldsborough was ordered to proceed to Charleston Bar for blockading duty. Then, in the first week of January, the *Florida* was assigned to the Florida coast, where, from January 7 to February 11, 1862, she cruised as far as Cedar Keys in an attempt to intercept a large shipment of arms known to be on the way from Nassau. Later another expedition was made in the same region (February 28 to March 15, 1862), after which the tedious duty of blockading recommenced off St. John's Fla., which, the flag officer warned Commander Goldsborough, was "the spot now." But no blockade runners appeared.

So the *Florida* resumed her old station before Charleston harbor, and, as it happened, she arrived just in time to take part in the capture of the British ship *Emily St. Pierre*.

The *Florida* seems to have been considered a valuable vessel on the blockade, for she was assigned to various parts of the coast as each in turn assumed importance to the Confederates. Thus in April, 1862, she arrived in St. Simon's Sound, Ga.; a month later she was ordered to Wassaw Inlet, Ga., and in June, she returned to the first-named place. But by this time she had been so long at sea that Commander Goldsborough was obliged to call attention to "the wretched condition of her boilers and steam chimneys, which make it impossible for us, under the most favorable circumstances, to carry steam sufficient to enable the ship to go more than 6 knots per hour." "Our bottom is very foul," the report concluded, "and it has been reported to me that three sheets of copper are off on the port side forward, besides being ragged in many places. I hope you will allow the ship to be docked and her boilers and steam chimneys put in a condition that we may successfully contend against the storms of the winter months."

Before the *Florida* could be ordered to the navy yard, however, Commander Goldsborough was promoted to the grade of captain, and, therefore, detached so that he might have "a more suitable command for active service." So the command of the ship devolved upon Lieutenant Commander R. W. Scott (August 27, 1862), who in turn was succeeded by Commander L. C. Sartori (October 27, 1862). A month previous to the latter date, however, the *Florida*, off St. Andrew's Sound, Ga., made a prize of the schooner *Agnes*, and then she spent several weeks on the blockade off Ossabaw Sound, until the last week in October, when the long-awaited orders were received and the ship was permitted to return to New York. Here, on November 13, 1862, Lieutenant H. E. Mullen assumed temporary charge of the *Florida* and four days later placed her out of commission.

When the *Florida* was again ready for service, she put to sea (March 9, 1863) under Commander J. P. Bankhead (March 7, 1863), proceeding at once to Hampton Roads for duty with the North Atlantic blockading squadron. By this time Wilmington, N. C., had become such an important port for the ever-active blockade runners, that Admiral Lee decided to despatch the *Florida* to that point without delay. It was here that she captured the Con-

federate steamer *Calypso* on June 11, and the schooner *Hattie* ten days later.

Shortly after this, Lieutenant S. D. Greene took command of the *Florida* (August 10, 1863) and cruised on the station until the arrival of Lieutenant Commander James Parker (August 24, 1863), but two weeks later his orders were revoked and Lieutenant W. W. Queen (September 7, 1863) assumed charge of the ship. At Beaufort, N. C., Commander Peirce Crosby reported on November 20, 1863, for the command of the *Florida*. On the 30th a blockade runner was chased off Frying Pan Shoals, and two days later the steamer *Wild Dayrell* was compelled to run ashore; on February 5, 1864, the *Nutfield* was shelled and destroyed, and on the 10th two more blockade runners were accounted for. By this time Commander Crosby had been ordered to the command of the *Keystone State* (March 8, 1864); so Acting Lieutenant E. C. Merriam remained in charge of the *Florida* until Lieutenant Commander Samuel Magaw could succeed him. From Newport News, Va., the ship then returned to her station on the blockade of the North Carolina coast, where she remained until September, when Commander Magaw received urgent instructions to proceed to New London for convoy duty and for the protection of fishing vessels off the New England coast.

From December 12, 1864, to February 26, 1865, the *Florida* was placed out of commission at the Brooklyn navy yard. When next she was put in service, it was for service as supply and store ship for the squadron on the North Atlantic coast. Her commanders were: Acting Volunteer Lieutenant W. Budd (February 26, 1865), Acting Master I. Bursley (September 6, 1865), Acting Volunteer Lieutenant W. Maise (September 9, 1865). Returning to the Washington navy yard early in January, 1866, the *Florida* was then again fitted for sea, and on March 16, 1866, she sailed under command of Commander H. Rolando, for service with the North Atlantic squadron, with which she cruised until April 4, 1867, when she was ordered placed out of commission. Under Lieutenant Commander A. Hopkins (April 7, 1867), the *Florida* made her last cruise, from Norfolk, Va., to Philadelphia, arriving there on the 8th and being formally placed out of service on the 26th. For another year the *Florida* was carried on the Navy Register; then, on December 5, 1868, she was offered at auction and sold to S. Ward for $19,200.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Annual Dues

The annual dues for 1915 became payable on January 1, 1915. There is no change in dues on account of bi-monthly publication. It is suggested that dues be paid in lump sums covering a period of two to five years; this method of payment has advantages for members as well as for the Institute and is practiced by a number of members, both regular and associate. Response to this notice will save the Institute a considerable sum in stationery and postage. Beginning January 1, 1916, members residing abroad permanently or for any length of time will be charged postage at the rate of fifty cents a year.

Special Notice

It is believed that the scope of usefulness of the PROCEEDINGS to members of the Institute can be increased and all members are invited to assist in this work. Should any topic occur to you on which you think an article could well be written, or on which you would like to read one, send such topic to the Secretary and Treasurer, together with such explanation or comment as may appear desirable in order that the intent of the suggestion may be clearly understood. The Institute is desirous of obtaining good "sea yarns" for publication. It is hoped that anyone who can spin such a yarn will submit it.

References

Attention is invited to the following articles which have appeared in the pages of the PROCEEDINGS during the past two years; they treat of subjects which closely concern Naval War College work; a perusal of them should prove profitable:

1913

Trained Initiative and Unity of Action: The True Bases of Military Efficiency. By Lieutenant Commander D. W. Knox, U. S. N.; page 41, Whole No. 145, March, 1913.

Logistics: Its Bearing on the Art of War. By Commander C. T. Vogelgesang, U. S. N.; page 63, Whole No. 145, March, 1913.

Column as a Battle Formation. By Lieut. Commander D. W. Knox, U. S. N.; page 949, Whole No. 147, September, 1913.

The Naval War College, the General Board and the Office of Naval Intelligence. By Commander W. S. Crosley, U. S. N.; page 965, Whole No. 147, September, 1913.

Scouting and Screening Operations. By Lieut. Commander W. S. Pye, U. S. N.; page 1139, Whole No. 147, September, 1913.

Organization of the Fleet for War. By Lieutenant R. E. Ingersoll, U. S. N.; page 1739, Whole No. 148, December, 1913.

1914

War and Policy. By Captain J. S. McKean, U. S. N.; page 1, Whole No. 149, June, 1914.

Moral Training in Preparation for War. By Charles M. Bakewell; page 157, Whole No. 149, January, 1914.

The Great Lesson from Nelson for To-day. By Lieut. Commander D. W. Knox, U. S. N., P. E., page 295, Whole No. 150.

Naval Policy as it Relates to the Shore Establishment and the Maintenance of the Fleet. By Captain John Hood, U. S. N., H. M., 1914; page 319, Whole No. 150, March, 1914.

Details of Navy Department Administration: Navy Department Policies. By Lieut. Commander N. L. Jones, U. S. N.; page 377, Whole No. 150, March, 1914.

Military Preparedness. By Naval Constructor Richard Gatewood, U. S. N., H. M., 1914; page 631, Whole No. 151, May, 1914.

What Should be the Relations Between Battle and Reserve Fleets. By Captain W. S. Sims, U. S. N.; page 727, Whole No. 151, May, 1914.

Old Principles and Modern Applications. By Dudley W. Knox, U. S. N., H. M., 1914; page 1009, Whole No. 152, July, 1914.

The Battle of the Sea of Japan: Translation Japanese General Staff Report. By Captain W. T. Hoadley, U. S. Marine Corps; page 961, Whole No. 152, July, 1914.

Some Foreign and Other Views of War and the Study and Conduct of War. By Captain Albert Gleaves, U. S. N.; page 1301, Whole No. 153, September, 1914.

Strategic Problems and Their Solution. By Captain R. von Labres, I. G. N. Translated by Surgeon J. F. Leys, U. S. N.; page 1409, Whole No. 153, September, 1914.

Bureau of Information

The Institute offers its services as a "Bureau of Information" on professional questions and will endeavor to obtain replies from the best qualified sources. Those "Questions and Answers" which are suitable for purposes of general information, will appear in the PROCEEDINGS. It is suggested that knotty questions

which come up in professional examinations for promotion may well be submitted to this department.

Membership

Since July 20, 1915, 1 life, 49 regular and 6 associate members have joined the Institute. 1 member resigned. The following members have died:

Rear Admiral J. M. Forsyth, U. S. N.
Rear Admiral John McGowan, U. S. N.
Ensign J. A. McCown, U. S. N.

The need for more members continues; bi-monthly publication should make the PROCEEDINGS more than ever valuable and necessary in keeping up with the naval profession; all members are asked to help in increasing the membership.

Notice

Whole Nos. 145 and 149 of the PROCEEDINGS (March, 1913, and Jan.-Feb., 1914) are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 25 cents per copy.

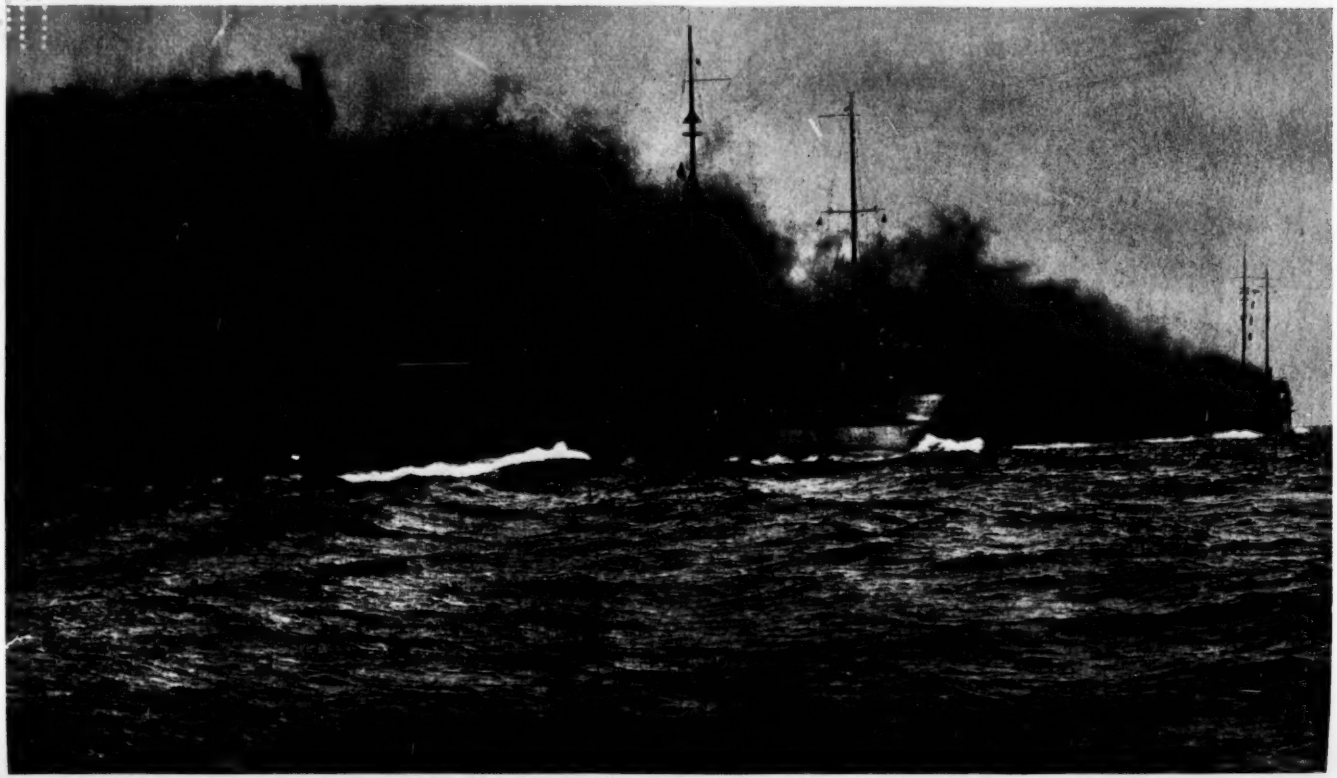
Address of Members

Members, especially those on the retired list, and civilians are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS are to be sent, and thus insure their receipt.

Book Department

The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers. Bills will be rendered upon delivery of books.

ANNAPOLIS, MD., July 20, 1915.



UNITED STATES DESTROYERS AT TOP SPEED THROWING A SCREEN OF PALL-LIKE SMOKE BETWEEN THE BATTLESHIP FLEET AND "ENEMY" SUBMARINES, IN THE RECENT NAVAL WAR GAME OFF THE RHODE ISLAND COAST

PROFESSIONAL NOTES

Prepared by LIEUTENANT C. C. GILL, U. S. Navy

GENERAL ARRANGEMENT

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Russia 1647
Spain 1647
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Order of sub-topics under the powers { vessels building, battleships, cruisers, destroyers, submarines, auxiliaries, personnel, naval policy.

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CURRENT NAVAL AND PROFESSIONAL PAPERS 1699

NAVAL POWERS

ARGENTINE REPUBLIC

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Rivadavia.....	27,940	22.5	12 12-in., 12 6-in., 16 4-in.	Fore River Co.	Completed
Moreno.....	27,940	22.5	same	New York Co.	Completed

NOTE.—Argentine has four destroyers, displacement 950 tons, contracted for (two built at Nantes and two at Bordeaux), launched in 1911 but not yet turned over to the government. Also four additional destroyers of about 950 tons to replace those sold to Greece, building at Krupp's Germania Works. (It is presumed that these destroyers have been taken over by France and Germany respectively, as war measures.)

AUSTRIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Prinz Eugen..	20,010	20	12 12-in., 12 5.9-in., 18 12-pdrs.	Trieste	Commissioned
Szent Istvan..	20,010	20	same	Fiume	Launched Jan. 17, 1914
Ersatz Mon'ch	24,500	22½	10 14-in.	Trieste	To be laid down, 1914
" Budapest	24,500	22½	same	"	" " " " 1914
" Wien....	24,500	22½	same	Fiume	" " " " 1914
" Hapsburg	24,500	22½	same	Trieste	" " " " 1915
Small Cruisers					
Saida.....	3,454	27	9 4.1-in., 2 6-pdrs.	Montalcone	Trials Apr., 1914
Helgoland	3,454	27	same	Fiume	Launched Nov. 23, 1912
Novara.....	3,454	27	same	"	" Feb. 15, 1913

NOTE.—Three destroyers launched in 1913, displacement 787 tons, nearing completion. Two submarines, displacement 550 tons, and three of 860 tons, contracted for in 1912 are to be built by Krupp Co. There are also 27 torpedo-boats of 250 tons displacement in various stages of construction. In lieu of definite information regarding progress in ship construction since outbreak of war conjectures may be based on dates in column headed "Remarks."

CHINA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Light cruisers					
Fei-Hung	2,600	22½	2 6-in., 4 4-in., 2 3-in., 6 3-pdrs.	N. Y. Ship Bldg. Co.	Sold to Greece
.....	4,800	27	.....	Montalcone	Ordered Nov., 1913
.....	1,800	24	.....	"	Contracted for Sept., 1913
.....	1,800	24	.....	"	same
.....	1,800	24	.....	"	same

NOTE.—Four destroyers, displacement 400 tons, are building, one at Trieste and three at Schichau. The three Schichau boats have been delivered.

DENMARK

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Niels Juel.....	3,675	16	2 9.4-in., 4 5.9-in.	Copenhagen	Laid down Sept., 1913

NOTE.—Three destroyers are under construction at Copenhagen and three submarines, displacement 200 tons, are being built by Whitehead Co. (The submarines have probably been taken over by England.)

FRANCE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
France.....	23,092	20	12 12-in., 22 5.5-in.	St. Nazaire	Commissioned
Paris.....	23,092	20	same	La Seyne	"
Bretagne.....	23,172	20	10 13.4-in., 22 5.5-in.	Brest	Launched April 21, 1913
Provence.....	23,172	20	same	Lorient	" April 20, 1913
Lorraine.....	23,600	20	same	St. Nazaire	" Sept. 30, 1913
Languedoc....	24,828	21.5	12 13.4-in., 24 5.5-in.	La Seyne	Laid down April 28, 1913
Normandie....	24,828	21.5	same	St. Nazaire	" July 5, 1913
Flandres.....	24,828	21.5	same	Brest	" Oct. 10, 1913
Gascogne.....	24,828	21.5	same	Lorient	" Oct. 1, 1913
Bearn.....	24,828	21.5	same	La Seyne	Contract Jan. 7, 1914

NOTE.—There are approximately six destroyers and 23 submarines under construction.

In *Engineering* of July 9, 1915, appears a most interesting description of modern submarines of the *Laubeuf* type, which have done so well in the present war. According to this, each vessel consists of inside and outside hulls, the outside being given generally the shape of the hull of an ordinary seagoing ship, having a straight stem, a vaulted stern, fine water-lines, and transversal sections which ensure to the boat good nautical qualities. The space comprised between the two hulls serves to contain the water ballast; it is always entirely empty when navigating on the surface and quite full when submerged. The inside hull is divided by transversal water-tight bulkheads into separate compartments, the number of which increases with the size of the boat. In all instances the crew space is forward in a separate compartment, containing no electric accumulators nor any other item of apparatus liable to vitiate the air. The men work in watches, as usual. The crew space contains a number of fixed berths, which varies with the size of the boat. On the larger boats an extra room with four berths is provided for the petty officers, and one with two fixed berths for the two officers. All boats contain a galley, with an electric range, a petrol stove and one or two lavatories. The safety appliances include a dropping keel fitted in the bottom part of the boat, and which can be disengaged at a moment's notice from the inside. The water can be driven out of the outside ballast tanks and all the inside trimming tanks by compressed air. The oxygen of the air inside the boat can be renewed. A floating buoy, fitted with a telephone cable, can be disengaged for communicating with surface ships. These vessels range up to nearly 1000 tons displacement.—*Naval and Military Record*, 7/14.

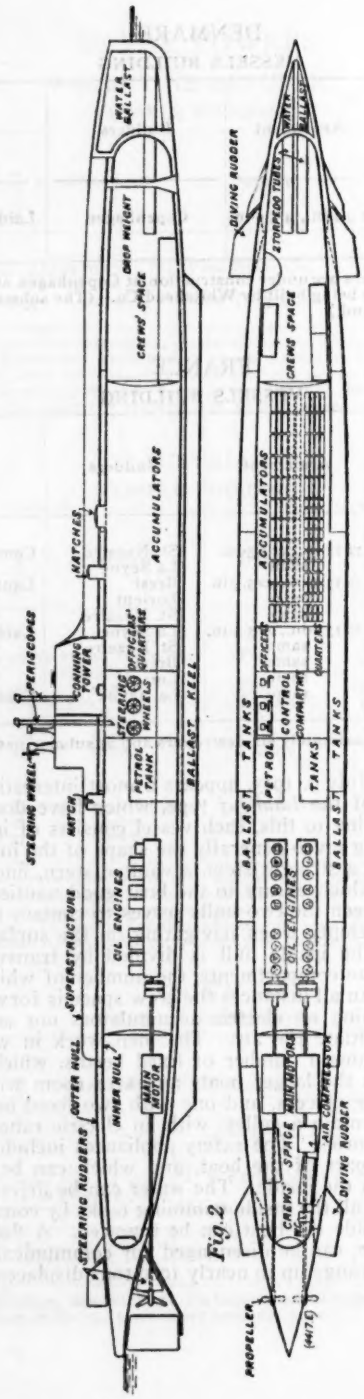


Fig. 2

THE FRENCH "LAUBEUF" SUBMARINE BOATS

GERMANY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Grosser Kurfürst	26,575	23	10 12-in., 14 5.9-in., 12 3.4-in.	Hamburg	Commissioned
Markgraf	26,575	23	same	Bremen	"
König	26,575	23	same	Wilhelmshaven	"
Kronprinz	26,575	23	same	Germania	Launched Feb. 21, 1914
Ersatz Worth	29,000	....	8 15-in., 16 5.9-in.	Kiel	Laid down Sept., 1913
"T" 1913	29,000	....	same	"	" May, 1913
Ersatz Friedrich III	30,000	....	8 15-in., 18 5.9-in.	....	" summer 1914
Cruisers of the Line					
Lützow	28,000	28.5	8 12-in., 14 6-in.	Dantzig	Launched Nov. 29, 1913
Derfflinger	26,500	28.5	same	Hamburg (Blohm & Voss)	Commissioned
Ersatz Hertha	28,000	28.5	8 12-in.	Wilhelmshaven	Laid down July, 1913
Ersatz Victoria Louise	.....	....	....	....	" summer 1914
Protected Cruisers					
Karlsruhe	4,900	28	12 4.1-in., 2 t. t.	Germania	Commissioned
Rostock	4,900	28	same	Howaldt	"
Regensburg	4,900	27.5	12 4.1-in.	Bremen	"
Graudenz	4,900	27.5	12 14.1-in.	Kiel	"
Ersatz Hela	5,500	27.5	10 6-in.	"	Laid down fall 1913
Ersatz Gefion	5,500	27.5	same	Stettin	" "
Ersatz Niobe	.....	....	....	....	" summer 1914
Ersatz Gazelle	.....	....	....	....	same

NOTE.—Germany has twelve destroyers and twelve or more submarines under construction. Tonnage of ships building uncertain. Changes in construction program because of war are problematical.

NEW GERMAN CRUISER "HINDENBURG."—In the report from Berlin that a battle cruiser was launched at Wilhelmshaven on August 1, and, by order of the Emperor, was named the *Hindenburg*, substitute for the *Hertha*, and that she belongs to the 1913 program. If so, she was laid down at Wilhelmshaven in June of that year. In ordinary circumstances this vessel should not have been on the stocks for more than two years. The average time for all the German dreadnoughts is only a little over 15 months. The delay which is manifest may be due to one of two causes. Either there is a deficiency of workmen, and men have been taken from this vessel to be put upon repairs or the construction of submarines; or she has been re-armed. Originally, it was intended that this vessel should carry eight 12-inch guns. It seems more than probable, however, that she is being given guns of 15-inch caliber, and that here we have the explanation of the late date at which she has been put afloat. As to the disclosure of her launch, it may be that this was permitted solely to honor the military hero whose name she bears and so to hearten the German people.

As is well known, the modern German fleet owes its existence to the Navy Law of 1900 and its subsequent amendments. It was by the amendment of 1906, which increased the foreign service fleet by five ships and the high sea fleet by one, that the battle cruisers which are now joining the navy were authorized. The first battle cruiser was generally reckoned to be the *Blücher*. She belonged to the 1906 program, and one battle cruiser has been authorized every year since. When war broke out, five were completed, the services of two of which have been lost, the *Blücher* being

sunk in the action on January 24 and the *Goeben* rendered useless in the Black Sea. Two have been completed during the past year, however, the *Derfflinger* and *Lützow*, both carrying as their heavy armament eight 12-inch guns. The only two battle cruisers known to be building were the *Ersatz-Hertha* and *Ersatz-Victoria Luise*, both of which are likely to have 15-inch guns, if not heavier pieces.—*London Times*, 8/14.

A FRENCH REPORT OF A GERMAN NAVAL VIEW-POINT.—Now a French paper reports that when this officer received the order at Heligoland it aroused indignation on all sides. It is stated that when, having accomplished the deed, Lieutenant Hersing returned to his base "all the officers" manifested their contempt towards him. "Without daring to lift his head, he muttered, 'It went against me to act as I did act, but I could not do otherwise.' He was crying. He then told how none of his men knew the object of the voyage, and how several times he was on the point of letting them into the secret in the hope of seeing the crew mutiny." We cannot judge the authenticity of this story.—*Naval and Military Record*, 8/25.

GREAT BRITAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Benbow	25,000	22	10 13.5-in., 16 6-in.	Beardmore	Commissioned
Emperor of India	25,000	22	same	Vickers	"
Iron Duke	28,000	22	same	Portsmouth	Commissioned Mar., 1914
Marlborough	25,000	22	same	Devonport	Trials Mar., 1914
Qu'n Eliz'b'h	27,500	25	8 15-in., 16 6-in.	Portsmouth	Launched Oct. 16, 1913
Warspite	27,500	25	same	Devonport	" Nov. 26, 1913
Valiant	27,500	25	same	Fairfield	" Dec., 1913
Malaya	27,500	25	same	Walker	Laid down Oct. 20, 1913
Barham	27,500	25	same	Brown & Co.	Launched Feb., 1914
Roy'l Sover'gn	25,500	21	same	Portsmouth	Laid down, Jan. 15, 1914
Royal Oak	25,500	21	same	Devonport	" Jan. 15, 1914
Resolution	25,500	21	same	Palmer	" Nov. 28, 1913
Ramillies	25,500	21	same	Beardmore	" Nov. 12, 1913
Revenge	25,500	21	same	Vickers	" Jan., 1914
Battle Cruisers					
Tiger	30,000	30	8 13.5-in., 12 6-in.	Brown & Co.	Launched Dec. 15, 1913
Light Cruisers					
Brisbane	5,400	25	9 6-in., 4 3-pdrs.	Sydney	Laid down Jan. 25, 1913
Birmingham	5,440	25.5	same	Elswick	Commissioned, Feb. 3, 1914
Lowestoft	5,440	25.5	same	Chatham	" Apr. 21, 1914
Nottingham	5,440	25.5	same	Pembroke	" Apr. 3, 1914
Aurora	3,600	30	2 6-in., 8 4-in.	Devonport	Commissioned
Arethusa	3,600	30	same	Chatham	"
Penelope	3,600	30	same	Barrow	Laid down Feb. 1, 1913
Phaeton	3,600	30	same	"	" March 12, 1913
Royalist	3,600	30	same	Dalmuir	" June 3, 1913
Galatea	3,600	30	same	"	Commissioned
Inconstant	3,600	30	same	"	Laid down April 3, 1913
Undaunted	3,600	30	same	Govan	Commissioned
Cleopatra	4,400	30	.....	Devonport	Laid down Feb. 26, 1914
Calliope	4,400	30	.....	Chatham	" Jan. 1, 1914
Conquest	4,400	30	.....	"	" Feb. 28, 1914
Cordelia	4,400	30	.....	Pembroke	Launched Feb. 23, 1914
Carysfort	4,400	30	.....	"	Laid down Feb. 25, 1914
Comus	4,400	30	.....	Wallsend	" Nov. 3, 1913
Caroline	4,400	30	.....	Birkenhead	" Jan. 28, 1914
Champion	4,400	30	.....	Hebburn	" Feb. 28, 1914

NOTE.—England has approximately 31 destroyers and 24 submarines under construction. (Changes in construction program since war are unknown.)

AMERICAN-BUILT BRITISH SUBMARINES.—That ten American-built submarines, completed in five months, have crossed the Atlantic and are operating with British fleets, five of them in the Dardanelles and five with the blockading fleet off Heligoland, was reported by the *New York Hearld* and other dailies this week. These submarines were constructed by the Bethlehem Steel Company and the Electric Boat Company, it is stated, their parts being made here and then shipped secretly to a shipyard in Montreal, where they were assembled by American workmen. In December, 1914, Charles M. Schwab, president of the Bethlehem Steel Company, came back from London with contracts for ten submarines, all of the latest type, at a cost of $500,000 each. Mr. Schwab had already started work on orders for ten other submarines. He found that Secretary of State Bryan objected to the construction of submarines for any of the belligerents as an unneutral act, and promised not to build any more submarines on American soil for the Allies. The ten submarines already partly completed were at the Fore River shipyards at Quincy, Mass., and these will not be delivered until the end of the war. But Mr. Schwab, in conjunction with the Electric Boat Company, promptly arranged to use the Vickers-Maxim yards at Montreal for fulfilling his fresh contracts. American workmen were shipped to Montreal and set at work on the parts, working in shifts covering 24 hours a day. All records for speed in submarine construction were surpassed. The submarines are of standard type, each 140 feet long, with four torpedo tubes, and equipped with Diesel heavy oil engines. They cost $500,000 each, an unusually high price, due to the expedition with which they were built. When the boats were finished, in May, the British Admiralty immediately sent ten complete submarine crews to Montreal. The vessels left Montreal for Gibraltar in July, and arrived there in good condition within two weeks.

In regard to the ten submarines constructed at the yards of the Fore River Shipbuilding Corporation for the British Government, J. W. Powell, president of the corporation, in a statement given out on September 4, said: "In view of the interest shown in the movements of certain submarines building at this yard, we have considered it advisable to request the Navy Department to detail officers of the United States Navy to accompany these boats whenever they are moved from this shipyard, either when they are drydocked or when they proceed to Provincetown for their trials. The Department has consented to detail these officers so that all question as to the possibility of the removal of the boats from this country to the possession of a belligerent during the present war is eliminated. It has further been arranged that when the boats are completed they will be sent to the Boston Navy Yard, where they will remain until such time as a disposition satisfactory to all parties can be arranged."—*Army and Navy Journal*, 9/11.

HEALTH OF THE NAVY.—"There never was a greater miscalculation than that based on wearing out or disconcerting the British sailor, who for nerve, moral force, and physical fitness has no equal." The authority for these words, the significance of which can hardly be exaggerated at a time like the present, is Professor W. J. Simpson, C. M. G., member of the Naval Medical Consultative Board, whose lecture on "Progress of Hygiene in the Navy and its Effect on the Health of the Sailors" is one of many interesting features of the current number of the *Journal of the Royal Naval Medical Service*. In the introduction to his historical survey, from which the above quotation is taken, Professor Simpson refers to the silent vigil which the navy is now keeping under very trying and dangerous conditions, remarking that however long this lasts our navy will bear the strain successfully "because it is well trained, well fed, and in a healthy condition. It is only men in good health and imbued with the traditions and splendid qualities of the British Navy that could stand the strain, with its attendant risks, and still be fit for the day of battle." He then describes the

application of hygienic measures to improve the health of the navy, dating back to the 18th century, and alludes to the setbacks experienced owing in some cases to the opinions of commanding officers that the reforms advocated would lead to effeminacy. For this and other reasons the struggle of the pioneers of sanitary progress in the navy was long and laborious, but of the value of their work there is abundant evidence in the annual reports on the health of the navy. Among the improvements that have taken place Professor Simpson mentions the supply of pure water by condensing sea water by means of Normandy's condensers and filters; the employment of bark and quinine for the treatment and prevention of malaria on expeditions in tropical climates; general vaccination against smallpox in 1844; a greater interest taken by the officers generally in the preservation of the health of the men; a higher standard of cleanliness demanded by the officers both for the men and the ship; the providing of drying arrangements for men's clothes; and the discarding of the daily practice of sluicing the lower decks, which was a fruitful source of catarrhs and chest complaints. But most convincing of all is the record of the annual death rate in the British Navy from disease. According to this, the average rate of mortality in the periods mentioned was as follows: 1776-1780, one death in eight sailors; 1810-1812, one in 30; 1830-1836, one in 72; 1885, one in 112; 1895, one in 143; 1905, one in 256; 1907, one in 298; 1910, one in 311; 1913, one in 309. The progress shown by these figures is indeed astounding.—*Naval and Military Record*, 7/28.

NAVAL SUPREMACY.—*Mr. McKenna on War Finance.*—Mr. McKenna, Chancellor of the Exchequer, last night addressed a crowded meeting at Preston on the subject of war savings. The meeting was held under the auspices of the Preston War Savings Committee.

Mr. McKenna said that the task which we undertook on the outbreak of war required time for its fulfilment. Looking back a year we saw that our enemies had made certain geographical gains, but they had lost in time more than they had gained in territory. Every month that went by brought the forces of the Allies nearer in equality until finally they would surpass in men, guns and munitions the whole power of Germany. (Cheers.)

The first of our burdens—the most indispensable of all for our very national life as well as for our power to continue the war—was to maintain the navy. (Cheers.) It was a condition of our fighting at all that our navy should be supreme.

What do you think, asked the Chancellor of the Exchequer, is the burden thrown upon us by the navy? Our seamen perform their task so silently and so surely that we almost forget that we have a navy, but it is the ever-vigilant presence of that navy which secures us our life. But the burden is no light one. We are now spending on our navy at the rate, in excess of what we spent in times of peace, of nearly half a million a day. That means that the labor of a million of men is required to assure the predominance of our fleet at sea. Think what that means and the new burdens it casts upon us. It means that the labor of a million men is withdrawn from ordinary production in order to secure and guarantee our naval pre-eminence.

Proceeding, Mr. McKenna replied to the criticism that Germany was superior to us in the matter of machinery. It was true that Germany, as she was prepared for war, had shown herself superior in machinery on land, but if they compared the two services, the sea service was vastly more dependent upon machinery than the land service, and when we looked, said the Chancellor, at the work of the British fleet and the German fleet he was prepared to say that in the matter of machinery we were more than able to hold our own. (Cheers.)—*London Times*, 8/4.

AUSTRALIAN NAVAL COLLEGE.—The Royal Australian Naval College at Captain's Point, Jervis Bay, New South Wales, receives each year 30 boys for training as naval officers. Candidates have, in the first instance,

to face an interviewing committee, composed of naval, medical, and educational experts, who determine whether a boy is of the right type. Those regarded as suitable for the naval profession are afterwards further tested to ascertain their educational abilities. The candidiates are awarded marks on each occasion, and those gaining the highest aggregates earn the coveted places. The college is open to all, and full advantage of this has been taken by state schools, whose scholars have supplied more than one-half of the numbers entered. The cadet midshipman enters the college at the average age of 13 years—that is, boys eligible for this year's examination must have been born in 1902. From the day the boy is entered on the books of the college the whole expense of his training is borne by the commonwealth. Last year there were five candidates for each vacancy, and as the work of the college and the prospects presented by a naval career are becoming better known to parents, it is anticipated that the competition for places will be as keen as on previous occasions. The applications from each state during the last three years were as follows:

	1912	1913	1914
New South Wales	36	50	49
Victoria	70	73	60
Queensland	6	12	11
South Australia	5	10	13
Western Australia	14	22	13
Tasmania	2	6	6
Totals	133	173	152

—*Engineering*, 8/6.

AUSTRALIAN NAVY.—The strength of the naval force of the Australian Commonwealth this year is returned as follows: Permanent (sea-going), 3700; naval reserve (marines), 493; naval reserve and cadets, 5024; Royal Australian naval reserve (sea-going), 750; making an aggregate of 9367. In consequence of the European War, the naval estimates of the Australian Commonwealth for 1914-15 showed a considerable expansion, amounting to £2,370,130; this included £1,220,000 for the maintenance of ships. The construction of the cruiser *Brisbane* and the destroyers *Torrens, Swan* and *Derwent* has been proceeding at the commonwealth dockyard and building-slips at Cockatoo Island, Sydney. These destroyers have a displacement of 700 tons each; they are to be fitted with turbine engines, working three screws, and they are to steam at the rate of 26 knots. They are each 245 feet in length by 24 feet 3 inches beam. Orders for an oil-supply steamer and a submarine depot ship have been placed in Great Britain. Progress has been made with the establishment of naval bases at Cockburn Sound, Western Australia, and Port Western, Victoria. The *Komet*, a German despatch vessel, captured during recent operations, has been added, under the name of the *Una*, to the Royal Australian Navy.—*Shipping Illustrated*, 8/6.

GREECE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battle Cruisers					
Salamis	19,500	23	8 14-in., 12 6-in., 12 3-in.	Vulkan Works, Stettin	Laid down July, 1912
	24,000	21.5	10 14-in.	Saint Nazaire	Reported that negotiations have been completed for this ship

HOLLAND

NEW CONSTRUCTION PROGRAMME

HAGUE, Wednesday.

The reply of the Dutch Government to the report of the Second Chamber on the Government bill for the extension of the Dutch fleet by two cruisers, four submarines, and some waterplanes, states that it is impossible to abandon the plan of building two cruisers, and adds that from close examination of the plans, it appears that the total cost of two cruisers and four submarines will not be £2,083,340, as originally estimated, but £2,333,340. The government further declares that the present system of defence in the Dutch Indies, especially in Java, is insufficient.—*Reuter, Naval and Military Record, 7/14.*

ITALY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Giulio Cesare ...	22,022	22	13 12-in., 18 4.7-in.	Genoa	Completed
Conte-di-Cavour	22,022	22	13 12-in., 18 4.7-in. 14 14-pdrs.	Spezia	"
Leonardo da Vinci	22,022	22	same	Genoa (Odero)	"
Andrea Doria...	22,564	23	13 12-in., 16 6-in.	Spezia	Launched March 30, 1913
Duilio.....	22,564	23	same	Castellamare	" April 24, 1913
4 ships	28,000	24	8 15-in., 16 6-in.	....	Will probably be laid down during spring and summer, 1915
Small Cruisers					
Basilicata	2,500	16.5	6 6-in.	Castellamare	Laid down Aug. 9, 1913
Campania	2,500	16.5	6 6-in.	"	" Aug. 9, 1913

NOTE.—Italy has about 15 destroyers and two submarines under construction.

JAPAN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Fuso.....	31,300	22.5	12 14-in., 16 6-in.	Kure	Launched Mar. 28, 1914
Fuso 2d.....	31,300	22.5	....	Kawasaki	Date when these ships will be laid down has not yet been settled
Fuso 3d.....	31,300	22.5	....	Mitsubishi	
Fuso 4th.....	31,300	22.5	....	Yokosuka	Laid down Nov. 20, 1913
Battle Cruisers					
Hiyei.....	27,500	27	8 14-in., 16 6-in., 8 t. t.	Yokosuka	Commiss'd Mar. 31, 1914
Haruna.....	27,500	27	same	Nagasaki	Launched Dec. 14, 1913
Kirishima.....	27,500	27	same	Kobe	" Nov. 30, 1913

NOTE.—Japan has two destroyers and two submarines under construction in England and France respectively.

NORWAY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruisers					
Bjorgvin	5000	16.5	2 9.4 in., 4 6-in., 6 4-in.	Messrs. Armstrong	Laid down Jan. 8, 1913
Nidaros	5000	16.5	same	same	Launched June 9, 1914

NOTE.—Norway has four submarines under construction. (Vessels building in England have been taken over as a war measure.)

RUSSIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Sevastopol	23,026	23	12 12-in., 16 4.7-in.	Baltic Works	Launched June 29, 1911
Petropavlovsk.	23,026	23	same	" "	" Sept. 9, 1911
Poltava	23,026	23	same	New Admiralty	" July 10, 1911
Gangut	23,026	23	same	" "	" Oct. 7, 1911
Emperor Alexander III	22,435	21	12 12-in., 20 4.7-in.	Nikolaieff	" Apr., 1914
Empress Marie	22,435	21	same	Ivan Bunge Cc.	" Nov. 3, 1913
Catherine II...	22,435	21	same	" " "	Laid down Sept. 1, 1912
Battle Cruisers					
Ismailia.....	32,200	28	12 14-in., 21 5.1-in.	Galerni	" Dec. 19, 1912
Kinburn.....	32,200	28	same	Baltic Works	same
Borodino.....	32,200	28	same	Galerni	same
Navarino.....	32,200	28	same	Baltic Works	same
Small Cruisers					
Adm. Butakow	7,500	32	15 5.1-in.	Putilow, St. Petersb.	Laid down Nov. 29, 1913
Adm. Spiridov.	7,500	32	same	" "	" Nov. 29, 1913
Svietlana.....	7,500	32	same	Neva!	" Dec. 7, 1913
Adm. Grieg....	7,500	32	same	"	" Dec. 7, 1913
Muravjev Amurski	4,500	..	8 5.1-in.	Elbing	Launched Apr. 11, 1914
Adm. Nevelskoj	4,500	..	same	"	Laid down Feb. 13, 1913
" Lazarev...	7,500	32	15 5.1-in.	N. F. & W. Nikolaieff	" Oct. 19, 1913
" Nachimow	7,500	32	.....	R. S. Co. "	same

NOTE.—Russia has about 45 destroyers and 19 submarines under construction or contract.

SPAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Espana.....	15,450	19.5	8 12-in., 20 4-in.	Ferrol	Commiss'd Oct. 23, 1913
Alfonso XIII..	15,450	19.5	same	"	Launched May 7, 1913
Jaime I.....	15,450	19.5	same	"	Laid down Feb. 5, 1912

UNITED STATES
NAVY DEPARTMENT
BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY, SEPT. 10, 1915

Name, type and no. of vessels	Contractor	Per cent of completion			
		Sept. 1, 1915		Aug. 1, 1915	
		Total	% on ship	Total	% on ship
Battleships					
36 Nevada	Fore River S. B. Co.	95.3	95.0	94.7	94.4
37 Oklahoma	New York S. B. Co.	97.8	97.8	97.3	97.3
38 Pennsylvania	Newport News S. B. Co.	86.2	83.3	84.0	80.8
39 Arizona	New York Navy Yard	70.7	67.6	68.9	65.5
40 California	New York Navy Yard	0.0	0.0	.....	.....
41 Mississippi	Newport News S. B. Co.	27.6	12.4	25.7	9.9
42 Idaho	New York S. B. Co.	38.0	26.2	35.5	22.1
Destroyers					
53 Winslow	Wm. Cramp & Sons	Del'v'd	8-7-15	97.6	97.6
55 Cushing	Fore River S. B. Co.	Del'v'd	8-21-15	98.3	98.3
56 Ericsson	New York S. B. Co.	Del'v'd	8-14-15	100.0	100.0
57 Tucker	Fore River S. B. Corporation	82.6	80.6	79.3	76.7
58 Conyngham	Wm. Cramp & Sons	83.9	82.7	82.2	80.9
59 Porter	Wm. Cramp & Sons	82.6	81.3	76.8	75.4
61 Jacob Jones	New York S. B. Co.	88.1	88.1	83.7	83.7
62 Wainwright	New York S. B. Co.	87.2	87.2	83.5	83.5
63	Fore River S. B. Corporation	46.9	41.3	36.7	31.4
64	Fore River S. B. Corporation	41.7	37.1	34.2	28.1
65	Bath Iron Works	44.4	41.0	32.7	27.3
66	Bath Iron Works	36.3	31.4	31.1	25.5
67	Wm. Cramp & Sons	22.2	14.5	15.4	7.1
68	Mare Island Navy Yard	6.6	5.2	4.8	4.4
Destroyer Tenders					
2 Melville	New York S. B. Co.	99.6	99.6	99.2	99.2
Submarines					
27 G-2[1]	Lake T. B. Co. (Bridgeport)	89.7	89.7	89.7	89.7
31 G-3[1]	Lake T. B. Co. (Bridgeport)	88.6	88.4	88.6	88.4
40 L-1	Electric Boat Co. (Quincy)	98.9	98.9	98.4	98.4
41 L-2	Electric Boat Co. (Quincy)	98.4	98.4	98.4	98.4
42 L-3	Electric Boat Co. (Quincy)	94.4	94.4	93.3	93.3
43 L-4	Electric Boat Co. (Quincy)	94.4	94.4	92.6	92.6
44 L-5	Lake T. B. Co. (Bridgeport)	77.2	72.8	74.4	69.8
45 L-6	Lake T. B. Co. (Long Beach, Cal.)	67.5	64.4	64.1	60.9
46 L-7	Lake T. B. Co. (Long Beach, Cal.)	64.4	60.1	61.9	57.9
47 M-1	Electric Boat Co. (Quincy)	86.2	84.0	83.6	81.1
48 L-8	Portsmouth, N. H., Navy Yard	49.0	46.8	43.6	38.9
49 L-9	Electric Boat Co. (Quincy)	79.3	75.0	76.6	72.2
50 L-10	Electric Boat Co. (Quincy)	76.4	71.0	73.2	67.8
51 L-11	Electric Boat Co. (Quincy)	71.3	64.7	67.8	61.2
52	Electric Boat Co. (Quincy)	0.0	0.0	0.0	0.0
53 N-1	Electric Boat Co. (Seattle)	18.7	4.1	11.2	0.0
54 N-2	Electric Boat Co. (Seattle)	18.6	4.0	11.2	0.0
55 N-3	Electric Boat Co. (Seattle)	18.7	4.1	11.2	0.0
56 N-4	Lake T. B. Co. (Bridgeport)	34.2	30.7	29.7	27.1
57 N-5	Lake T. B. Co. (Bridgeport)	32.4	29.3	29.1	26.8
58 N-6	Lake T. B. Co. (Bridgeport)	31.8	28.6	27.7	25.3
59 N-7	Lake T. B. Co. (Bridgeport)	31.9	28.7	28.0	25.7
Submarine Tenders					
2 Bushnell	Seattle Construction & D. D. Co.	94.0	90.9	92.7	89.7
Fuel Ships					
14 Maumee	Mare Island Navy Yard	95.6	95.2	95.1	94.7
15 Cuyama	Mare Island Navy Yard	0.0	0.0	.....	.....
Miscellaneous					
Supply Ship No. 1	Boston Navy Yard	22.5	18.0	19.9	14.2
Transport No. 1	Phila. Navy Yard	31.0	23.6	21.0	13.5

[1] Contracts forfeited, vessels being completed New York Yard.

U. S. S. "NEVADA."—There is now nearing completion in the Fore River Shipbuilding Corporation's yard at Quincy, Mass., the first-class battleship *Nevada* for the United States Government. This vessel was authorized by Congress on March 4, 1911, and the contract was signed on January 22, 1912. The *Nevada* is 575 feet length of waterline, 583 feet length over all, 95 feet 3 inches breadth to outside of armor, and fully loaded will displace 28,500 tons of water.

As contributing to this enormous weight, there were worked into the vessel 6000 tons of steel plates; 2350 tons of steel shapes; 1860 tons of nickel steel plates; 1230 tons of special treatment steel plates; and 225 tons of high tensile steel plates; while to hold these various members together, no less than 3,290,350 rivets have been driven, in addition to which there are 7530 tons of armor for protecting the vital parts, such as machinery, magazines, gun mechanisms, etc.

The armament of the *Nevada* consists of ten 14-inch guns, twenty-one 5-inch guns, four 3-pounder saluting guns, and four submerged torpedo tubes. The 14-inch guns are arranged in three-gun and two-gun turrets all along the centerline of the vessel—a disposition of turrets of which the United States may justly claim the credit of having introduced to modern warship design, in view of the fact that excepting the *Rivadavia* and *Moreno,* practically all recent modern war vessels have followed this arrangement. The *Nevada* is the first vessel built in the United States upon which three guns in one turret have been arranged, and the results of this are being looked forward to with great interest by United States naval authorities.

The *Nevada* is expected to steam 21 knots per hour. She is propelled by Curtis turbines now in course of erection in the machine shop, these turbines driving two propellers, each 14 feet 3 inches diameter, at 222 revolutions per minute. To furnish steam to the turbines there are 12 water-tube boilers of Yarrow express type; these boilers being designed for a steam pressure of 295 pounds per square inch. The heat is generated by oil fuel, of which there is capacity for 2000 tons in 23 specially built compartments at the bottom of the vessel.

When the *Nevada* is in commission there will be on board: The commanding officer, 26 wardroom officers, 16 junior officers, a chaplain, 12 warrant officers, a crew of 810 men, and 50 additional enlisted men, making a total of 915 in all.

The *Nevada* was launched on July 11, 1914, the launching weight, including the weight of cradle and sliding ways, being 11,940 tons, which weight exerted a pressure of nearly three tons per square foot on the fixed launching ways. It is expected the *Nevada* will leave the yard for her trial trips within the next two months, at the completion of which she will return to the yard and be completed for delivery to the United States Government. —*Fore River Log* (*The Nautical Gazette,* 9/2).

DESTROYER "PORTER."—The U. S. torpedo-boat destroyer *Porter* was launched last Thursday at the yards of William Cramp & Sons' Ship and Engine Building Co., Philadelphia. She is one of the six 1090-ton class of destroyers of which only one, the *Tucker,* building at Quincy, Mass., remains on the stocks.—*Shipping Illustrated,* 8/28.

DESIGN FOR SIX NEW DESTROYERS ACCEPTED.—The designs for the six torpedo-boat destroyers authorized by the last naval appropriation act have just been completed in the Bureau of Construction and Repair of the Navy Department, to produce certain important military characteristics desired by the General Board. The design marks a distinct departure in many respects from that of preceding classes.

The maximum sustained sea speed has been made 30 knots, while a large radius of action at cruising speed has been maintained. Those guns located in the waist on previous vessels have been mounted amidships at such a

height as to increase their efficiency under rough water conditions materially. In addition care has been taken to guard, so far as possible, against the tendency existent in most small, light vessels to pitch and roll, and every effort consistent with their military requirements has been made to render these vessels comfortable from the standpoint of living accommodations.

The main characteristics will be: Length, 310 feet; beam 30 feet 7 inches; draft, mean, 8 feet; displacement, 1125 tons; battery, four 4-inch rapid-fire guns, two 1-pounders, anti-aircraft guns, four triple torpedo tubes; machinery, steam turbines, oil-fuel-burning water-tube boilers.—*N. Y. Times*, 8/1.

ALL SUBMARINES OF "F" CLASS HAVE SERIOUS DEFECTS IN COMMON, SAYS NAVAL BOARD.—That serious weaknesses are common to all four of the navy's *F* type of submarines is an item in the report of the Board of Inquiry which made an investigation at Honolulu immediately after the loss of the *F 4* with her crew of 22 last March. The report reads:

"The structure of the hull had not suffered loss of strength by corrosion of hull plating."

Inherent Faults in Engines.—"The propelling engines (Diesel oil type, four cycle) have inherent faults and are difficult to keep in repair, but were kept in as high a state of efficiency as was practicable within the limitations of said design.

"This unsatisfactory condition of the propelling engines had no bearing on the loss of the submarine, as this boat at the time of her loss was being propelled by the electric motors and storage batteries.

"The electric motors were in good condition, having been repaired by the ship's force, assisted by the navy yard force at the United States naval station, Pearl Harbor, Territory of Hawaii.

"The storage batteries were in good condition within the limitations of design.

"The storage batteries were always in a state of being more or less electrically 'grounded,' due to the leakage of electrolyte, or by capillary action of the electrolyte or moisture and poor insulation, or bad electrical contact and these said 'grounds' have been noted to be of sufficient intensity at times to cause flame and the fusing of electrical connections.

"This condition is well known to the officers and men of this submarine torpedo-boat division and due care is exercised in attempting to reduce this danger to a minimum.

"The storage batteries during the charging evolved excessive quantities of hydrogen gas, and, further, during the early stages of discharging quantities of hydrogen gas were evolved and the fumes of hydrogen and of acid became noticeable in the interior of the boat on long dives."

Reports Prior Explosion.—"On the *F 4*, March 6, 1915, while one electrical ventilator blower was stopped for a short period for minor repairs, probably from a 'ground' in the ventilating blower's electrical circuit, a hydrogen explosion took place, which damaged the battery deck and broke several separators of the cells of the storage batteries.

"The conditions under which an explosion of hydrogen is always possible obtain in all the boats of the *F* class.

"The covering of the storage batteries of the battery deck, in accordance with specifications for submarine torpedo-boat No. 23, is to be practically gas-tight and water-tight, which condition does not obtain, as this so-called battery deck does permit seepage into the batteries.

"The sea water has at times seeped into the cells of the storage batteries of the boats of the *F* class, causing the evolution of chlorine gas, which gas is quickly destructive of life.

"A comparatively small amount of sea water can cause the liberation of sufficient chlorine gas to asphyxiate the crew of a submarine while in a submerged condition.

"This condition obtains in all boats of the *F* class, and in the submarine torpedo-boat *F 1* a small quantity of sea water seeped into three of the cells

of the forward storage battery, damaging the cells and liberating quantities of chlorine gas. No facilities or injuries to personnel followed, as the boat was moored to the dock and the hatches were open at the time."

Trouble with Steering Gear.—"The steering gear of the submarine torpedo-boat *F 4* had in the past given trouble, but had been repaired. The design of the said steering gear is good and satisfactory.

"All inspections of safety appliances, as far as can be ascertained, have been carried out, as required by the navy regulations and orders from the division commander of this division.

"All inspections were regularly carried out by the commanding officer of the submarine.

"The *F 4* was docked recently and the question of stability investigated by the officers of the navy yard and found to be satisfactory. In general, the condition of the *F 4* compared favorably with the other three boats of this type. The boat was maintained at as high a state of efficiency as was practicable *within the limitations and deficiencies existing in this type.*

"The action of the *F 4* has in common with the other boats of the same type, in diving or trimming down, been irregular, and the depth to which such a submarine torpedo-boat would descend is uncertain, and the method of checking such a descent is dependent more upon the skill of the commanding officer than upon the mechanical appliances of the boat.

"The officers and men of the *F 4* were, in so far as can be ascertained, diligent and alert in the performance of their duties, and no reluctance was shown by them in operating the said *F 4*, even though the said officers and crew were well aware of the existing defects."—*N. Y. Herald*, 9/1.

PLAN FOR NAVAL RESERVE

WASHINGTON, September 2.

Plans of the Navy Department for the organization of a national naval reserve, embracing retired officers, former enlisted men, other branches of the Federal and State Governments, and volunteer civilians, were announced to-day by Franklin D. Roosevelt, Acting Secretary. It is expected to obtain under the plans the services of not less than 50,000 men for the National Naval Reserve, exclusive of the Naval Militia of the various states, now numbering about 7000 men. With the navy included, these plans contemplate giving the navy not less than 125,000 men for naval service in war, as follows: Regular navy, present strength, including the Marine Corps, 61,500; probable increase in enlisted force of the navy by the coming session of Congress, 6500; present State Naval Militia, 7000; proposed National Naval Reserve, 50,000.

Acting Secretary Roosevelt's announcement of the plan for the organization of the National Naval Reserve follows:

"The Department has had under consideration for some time a plan for the proper organization of various elements which should be considered a natural reserve from which the navy could draw outside of its regularly constituted forces. It is, of course, well known that so-called war plans have long been drawn as a part of the regular duty of the service and that these war plans contemplate a material increase in officers, men and vessels in case of emergency. Outside of the regular navy and the State Naval Militias, the plan of organization contemplates a national naval reserve, to be constituted briefly as follows:

"1. *Retired Officers and Former Enlisted Men of the Navy.*—The organization of retired officers already exists, and a step toward securing a reserve of former enlisted men was taken last spring by Congress. While the results of this examination have not been large during the two months it has been in effect—115 men have enrolled up to September 1, 1915—it is believed that an increasing number of men whose enlistments expire will take advantage of the opportunity offered; and it is already having the effect of increasing the number of re-enlistments.

"2. *Other Branches of the Federal and State Governments.*—This means the co-ordination of the Coast Guard, *i. e.*, the Revenue Cutter and Life Saving Services, the Lighthouse Service, the Coast Survey, the state nautical training schools, harbor police, etc., in such manner as to fit readily into the naval service at short notice. Little legislation is necessary to accomplish this, and the organization of this work is already underway.

"3. *Volunteer Civilians.*—It is believed that the reserve of personnel should total 50,000 officers and men. What is particularly desired is not merely numbers, but individuals who will be capable of doing the highly specialized service which exists in modern navies. For instance, in war-time the navy would need the services of possibly 1000 additional radio operators; it would require local pilots for inside waters, helmsmen, gunners, gasoline motor experts, signal men, etc., besides, of course, first-class seamen. The Department has had many letters asking whether an opportunity could be given to individuals to take courses of training in these specialties, and if the general plan is approved, it is hoped that next summer courses of instruction can be started, using reserve or other available ships, and giving to those who desire three or four weeks of training so that they could become of some definite use if called upon.

"Any amateur operator, any yachtsman or motorboat enthusiast, in fact, any citizen with intelligence and application could learn how to fit into some place where he might be needed. Possibly some form of certificate could be given at the close of instruction, showing exactly what services the individual is capable of performing, the holder to be under no further obligation than to keep the Navy Department, at stated periods, informed of his address.

"4. *Merchant Vessels, Yachts, and Power Boats.*—It is obvious that the navy would need a great number of auxiliary ships as patrol boats. Steps have already been taken to organize the merchant shipping, but much remains to be done. Modern naval operations have shown the great need of a large number of small and fast yachts and motor boats of a type as seaworthy as possible. The Department has already endeavored to co-operate with the power squadrons, and it will be possible, in connection with the training of volunteer civilians, to list all suitable vessels and to train their crews in the duties that would be expected. This training would be given in conjunction with the use of naval vessels in the summer time, and would be in charge of regular officers."

It was learned to-day that motor boats of a special type for possible use as submarine chasers were being built at Boston by a group of six men interested in national defence. They are gasoline launches with high free-boards, each boat mounting a rapid-fire gun, so constructed as to be able to pass over minefields without danger and capable of going 20 to 30 miles off shore. The plan of the navy, as announced to-day, is to take in these motor boats and the men trained to operate them.—*N. Y. Times*, 9/3.

NAVY VESSELS TO HAVE SHORTER LAY-UPS.—Hereafter vessels of the navy will, as usual, be docked twice a year for painting and minor repairs, but general overhauling will be given only upon recommendation by the Board of Inspection and Survey. This will do away with laying the ships up annually for several months for overhauling, during which the officers and crews heretofore enjoyed free shore leave, a demoralizing practice, as it necessarily carried with it a practical suspension of all drills and exercises for too long a period. To take two or three months out of a crew's training each year is certain to lower its standard of efficiency. The new order will not deprive the officers and men of necessary holidays; ample leave will be allowed them, and when at all possible, leave for the Christmas holidays will be granted.—*Marine Journal*, 9/11.

EX-PRESIDENT TAFT ADVOCATES LARGER NAVY.—Ex-President Taft in his speech at the Panama-Pacific Exposition on "Taft day," September 2, gave

an outline from his viewpoint of what the country needs at present in the way of preparedness for war. An adequate navy and strong coast defence were the two main pleas of his speech. He declared that the United States had coast defences just as formidable as any of the belligerent nations with a few exceptions, which could be remedied in a short space of time. "What we need most," he said, "is 10,000 more men to man the defences and 600 officers. We need more ships and a larger merchant marine, and also more shipyards in order to turn out the supply which must answer the present demand." Mr. Taft advocated an increase in men in the navy, saying that the service is short 18,000 sailors and 900 officers. In declaring for a larger navy as being more important than a large standing army he explained America's situation regarding the oceans, and also said that a large navy is never dangerous, but a large standing army is apt to be a tool for ambitious commanders anxious to enlarge a country's territory.—*Army and Navy Journal*, 9/11.

FRANKLIN D. ROOSEVELT ON THE NAVY.—Franklin D. Roosevelt, Assistant Secretary of the Navy, writing in the Economic World of "The Cost of the United States Navy," does not align himself with those who would economize in the annual expenditures for the Navy Department by the elimination and abandonment of the so-called "useless navy yards." "At one time they undoubtedly were wastefully managed," he says, "and were not useful from the military point of view. During the last few months a great change has come over theories about navy yards. Many who thought two great bases on this coast sufficient have realized that the development of the submarine and aircraft requires many sub-bases to give them their greatest effectiveness, and also hitherto unthought of needs in the rapid construction of ships and in the manufacture of vast quantities of supplies and ammunition make it at least doubtful whether the government should now allow any existing plant to fall into decay, for in the matter of private shipyards capable of rapidly building warships this country possesses, unfortunately, too few. . . . . It would seem to be the best policy of the government at the present time to maintain every available government plant which is physically in good condition and capable of active use in time of war. It should be our aim to maintain our yards at minimum cost in time of peace, but in such a way that they would be capable of maximum expansion and usefulness in time of war. We should help to pay the fixed charge by utilizing existing facilities so that their physical condition may be kept up and the nucleus of a trained force necessary to run them may be kept in being."

Three great reforms remain to be carried into effect, Mr. Roosevelt adds. "The first is in the matter of appropriations. The present system is, to say the least, archaic, and I have long believed that for proper knowledge as to what our money should be spent for and how it is actually spent some form of budget system must be devised. The second reform is the proper correlation of work done at the different navy yards and shore stations. Keeping in mind the necessity of having these yards in a condition at any time to expand to utmost capacity, they can and should be used in times of peace for the work for which they are most fitted. For instance, it is bad business management to manufacture flags at every yard if a saving can be made by making them all at a large plant in one yard. In the same way, it would be indefensible to turn out articles requiring a maximum use of power in a yard where the cost of coal is highest. The last point applies to the whole naval problem. Everything points, as it has for years, to the necessity of a continuing program or policy on the part of the government. There are many glaring examples of decisions in the past on the spur of the moment which later had to be changed or which later caused economic waste. This has been due in part to our general system of government. It has been due in part to what we call 'politics,' and it has been due in part, it must be frankly admitted, to the inability of military and naval experts

to agree on the military and naval necessities. But I am firmly of the belief that if the average citizen would study a little more closely the questions of national defence in their larger view, and would insist to his legislative representative that the whole subject should be placed on a broad, continuing basis, those who are charged with the working out of the problems of defence would be able to establish on a more economical and on a more efficient basis the whole naval and military structure."—*Army and Navy Journal*, 9/11.

THE PRESIDENT URGES NAVAL AND MILITARY PREPAREDNESS.—*Letter from President Wilson to Secretary Daniels:*

THE WHITE HOUSE, WASHINGTON, July 21, 1915.

My Dear Mr. Secretary.—I have been giving, as I am sure you have also, a great deal of thought to the matter of a wise and adequate naval program, to be proposed to the Congress at its next session, and I would like to discuss the whole subject with you at the earliest possible date.

But first we must have professional advice. I would be very much obliged if you would get the best minds in the Department to work on the subject; I mean the men who have been most directly in contact with actual modern conditions, who have most thoroughly comprehended the altered conditions of naval warfare, and who best comprehend what the navy must be in the future in order to stand upon an equality with the most efficient and most practically serviceable. I want their advice, a program by them formulated in the most definite terms. Whether we can reasonably propose the whole of it to the Congress immediately or not we can determine when we have studied it. The important thing now is to know fully what we need. Congress will certainly welcome such advice and follow it to the limit of its opportunity.

It should be a program planned for a consistent and progressive development of this great defensive arm of the nation, and should be of such a kind as to commend itself to every patriotic and practical man.

I shall return to Washington in a few days and shall be glad to take this important matter up with you at your early convenience. Cordially and faithfully yours,

WOODROW WILSON.

Hon. Josephus Daniels, Secretary of the Navy.

The Letter to Secretary Garrison:

THE WHITE HOUSE, WASHINGTON, July 21, 1915.

My Dear Mr. Secretary.—I have been giving scarcely less thought than you yourself have to the question of adequate preparation for national defence, and I am anxious, as you know, to incorporate in my next message to Congress a program regarding the development and equipment of the army and a proper training of our citizens to arms which, while in every way consistent with our traditions and our national policy, will be of such a character as to commend itself to every patriotic and practical mind.

I know that you have been much in conference with your professional associates in the Department and that you have yourself come to some very definite conclusions on these exceedingly important matters. I shall be away from Washington for a few days, but I would be very much obliged if you would be kind enough to prepare for me a program, with estimates, of what you and the best-informed soldiers in your counsels think the country ought to undertake to do. I should like to discuss this program with you at as early a time as it can be made ready. Whether we can reasonably propose the whole of it to the Congress immediately or not we can determine when we have studied it. The important thing now is to know fully what we need. Congress will certainty welcome such advice and follow it to the limit of its opportunity. Cordially and faithfully yours,

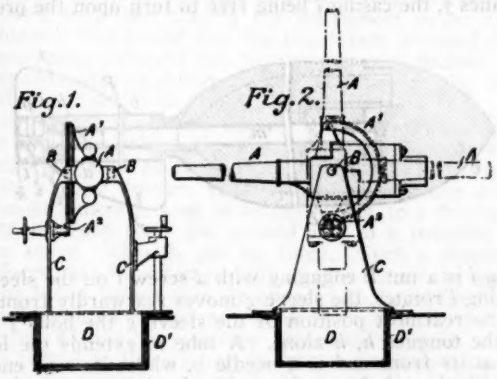
WOODROW WILSON.

The Hon. Lindley M. Garrison, Secretary of War.

U. S. MERCHANT VESSELS FOR NAVAL USE.—The Naval Board of Inspection and Survey for ships of the Navy Department is making a survey of all the American merchant vessels with a view to their use by the government in the event of war. Every ship which flies the American flag is being taken into consideration, its tonnage, condition, speed, etc., noted, together with its availability as an auxiliary of the U. S. Navy. The survey will include the vessels on the Great Lakes as well as ocean-going ships. The government already has in hand a complete list of the German merchant ships, as well as the two warships, now interned in American waters.— *Army and Navy Journal*, 7/31.

ORDNANCE AND GUNNERY

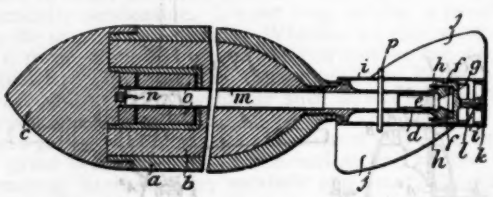
HIGH-ANGLE ORDNANCE, INVENTED BY SIR A. T. DAWSON AND G. T. BUCKHAM, LONDON, MAY 12, 1914.—This invention relates to gun-mountings of the kind in which the gun can be elevated from horizon to horizon—that is to say, through an angle of 180° or more. According to this invention, a rotary or stationary chamber is provided beneath the mounting for the purpose of enabling the gun to be loaded when firing vertically, or at large angles of elevation approaching the vertical, without



the necessity of depressing the gun to a convenient loading position. This chamber also serves to receive the empty cartridge-cases when the breech of the gun is contiguous to this chamber, and, furthermore, enables the distance of the trunnions above the deck in the case of a naval mounting, and the distance above the ground in a garrison gun, to be reduced. *A* is the gun, *B, B* are the trunnions, and *C, C* are the carriage side cheeks. *D* represents the aforesaid chamber, which, in the example shown, is attached to or made integral with the carriage cheeks, and is carried by a bearing D^1 let into the deck in a naval mounting, or into the base-plate in the case of a garrison mounting; the chamber in this case serves as the training pivot. If the chamber *D* be made stationary—that is, unattached to the carriage cheeks—it is let into the deck or base-plate, as above stated, and the carriage cheeks may then carry a ring which is rotatably mounted at the top of the chamber. In both cases the chamber is made of substantial diameter, so that a comparatively long recoil can be obtained. The chamber *D* may be of such a depth that a gunner can be accommodated therein to assist in loading the gun when the latter is approaching the maximum angle of elevation. The top part of the said chamber may be provided with a portable cover for the purpose of closing the chamber when the mounting is not in use. The carriage is adapted to be trained

in any suitable manner through a complete circle, and the gun may be elevated by means of an approximately semicircular rack A^1 attached to the gun-cradle and meshing with an elevating-pinion A^2 mounted in one of the carriage side cheeks. (Accepted May 19, 1915.)—*Engineering*, 7/23.

NEW TYPE OF BOMB, FOR USE BY AEROPLANES, PATENTED, MAY 13, 1914.—This invention relates to bombs especially adapted for use in connection with aeroplanes or airships. According to this invention, the bomb consists of a body containing the explosive charge. The body is preferably of cylindrical form, closed at both ends, and provided with a pointed nose, and at its rear end is a prolongation or tail-piece, within which the detonating charge is contained. A tube extends the length of the body, through which tube the detonating charge is capable of passing, and at the front end of the tube is a needle. The detonating charge is secured to the prolongation by bolts, which are retained in position by a sleeve, and on the prolongation is a rotatable vane, which, as it revolves, moves the sleeve, and frees the bolts. *a* is the body of the bomb, containing a main explosive charge *b*. The body *a* has a pointed nose *c* and a tubular prolongation *d*, which carries the pellet *e* of the detonator. The pellet *e* is secured to the prolongation *d* by bolts *f*, which are retained in position by a sleeve *g* and by the tongues *h*, *h* connected to it. On the tail-piece *d* is a cylindrical casing *i*, carrying vanes *j*, the casing *i* being free to turn upon the prolongation *d*.



On the casing *i* is a nut *k* engaging with a screw *l* on the sleeve *g*, so that when the casing *i* rotates, the sleeve *g* moves rearwardly from the position shown. In the rearmost position of the sleeve *g* the bolts *f* are retained in place by the tongues *h*, *h* alone. A tube *m* extends the length of the body *a*, and at its front end is a needle *n*, whilst its rear end is in communication with the tubular prolongation *d*. Adjacent to the needle *n* is the explosive charge *o*. A removable safety-pin *p* is provided to lock the pellet *e* in the prolongation *d*. When the bomb is released from the airship and falls, the vanes *j* rotate the casing *i* and nut *k*, and move the sleeve *g* rearwards, the pellet *e* being then lightly retained by the tongues *h*, *h*. When the bomb strikes the target, the inertia of the pellet *e* causes its conical end to overcome the tongues *h*, *h*, and the pellet *e*, falling through the tube *m* and impinging on the needle *n*, fires the cap exploding the explosive charge *o*, and consequently the main charge *b*. (Accepted May 26, 1915.)—*Engineering*, 7/30.

THE EFFECTS OF SHELL FIRE.—One of the consequences of the present war will be to revolutionize the art of killing human beings with gun-fire, this being the final object of artillery, and not the wanton destruction of houses, buildings, cathedrals even, and the making of more or less large holes in the ground. On the various fields of battle men have frequently been found exactly in the position they occupied when the shell which killed them exploded, the men showing no sign of wound. These men when they met their death were generally protected from the direct action of the bursting shells, which were those fired by the French 75-mm. guns. There is no noxious gas known, says *Engineering*, which is capable of

producing such an instantaneous effect, and certainly none is evolved from the shells, seeing that the high temperatures developed by the detonation of the high explosives now used for charging shells, explosives which are trinitrated hydrocarbides (benzol, phenol, toluol, naphthol) of the aromatic series, can only lead to the giving out of carbon monoxide and cyanogen, two gases which are but slow in their action.

The men are killed by a sudden stoppage in blood circulation, and it is interesting to note in this connection an explanation put forward by Mr. R. Arnoux before the French Society of Civil Engineers after the reading of a paper, on May 28, by Major Ferrus, on French, German, and Austrian guns. Mr. Arnoux received, in January last, from a superior officer commanding at the front a pocket aneroid barometer which had been rendered unserviceable by the explosion close to it of a German high explosive shell. On examination, the speaker found the barometer to have been simply put out or order. It had ceased to act because one of the two transmission levers, connected with the hand, and which normally bears on the other lever, had shifted and had, instead, taken up a position underneath this other lever. This could only have been produced by an abnormal swelling out of the aneroid system, due, as is manifest, to a considerable barometric depression; the little instrument had acted as a minimum recording instrument. After shifting the two levers back to their original position by hand, and then placing the instrument under the bell of a vacuum machine, it was found that the two levers changed their position when the barometric pressure fell to 410 mm. (16 inches) of mercury which corresponds approximately to the pressure at the top of Mont Blanc, the altitude of which is 4810 m. (15,780 feet).

The explosion, therefore, had led to a sudden barometric or static depression in the room where the instrument was placed—a distance of less than 3 m. (less than 10 feet) from the point where the shell burst, of at least $760 - 410 = 350$ mm. (13.8 inches) of mercury, corresponding, from the formulæ generally used in aerodynamics, to a driving velocity of the air of 276 m. (905 feet) per second and to a dynamic pressure of 10,360 kg. per sq. m. (2123 lb. per sq. foot). Such a dynamic pressure, however produced, has for effect to hurl up into the air, or to crush on the ground, all the living beings directly exposed to it, whilst in the case of those who are sheltered behind any kind of protection, the very sudden static depression of the surrounding atmosphere which ensues, comes into play. In regard to these latter, the air and carbonic acid in solution in the blood, in a proportion which is the larger the higher the ambient atmospheric pressure, are disengaged from the blood in the shape of minute gaseous bubbles as soon as the pressure decreases too suddenly from any cause. These bubbles are driven into the small arteries under the influence of the pressure exerted by the heart. If their diameter is greater than that of the small arteries, they form so many gaseous plugs, which instantaneously stop the blood circulation. They are produced the instant the atmospheric depression takes place, and death occurs before there is time for them to dissolve back in the blood when the ambient atmospheric pressure returns to normal.

The sudden action required to bring about such a state of things is the characteristic feature of the shattering nitrated explosives now used, which combine power and instantaneity both far in excess of those possible with the use of black powder. The projectiles charged with these explosives were at first destined to destroy all kinds of fortified works and to demolish trenches, and the discovery of their unexpected action upon living beings is quite as important as the discovery of the new explosives themselves. Their radius of action is less than the possible one of shrapnel, but they are more deadly than the shrapnel, for in their radius of action no living being escapes, whilst the shrapnel is dangerous only when one of its balls or fragments strikes home.—*United Service Gazette*, 7/22.

PENETRATION *versus* VOLUME OF FIRE.—Although Paris experts do not conceal their admiration for the designs of the *Queen Elizabeth*, unanimously regarded as the "meilleurs instruments d'offensive" in existence, they yet persist in the opinion that up to the present the war has not thrown any decisive light on the vexed problem of the relative merits of penetration at long range and volume of fire. Especially, the contention that superior calibers and weight of shells are sufficient to ensure superior accuracy at extreme distances, and, therefore, confer the benefit of the first blows, is not accepted without a good deal of reservation. In the Coronel fight, it is remarked, ballistic superiority belonged to the 9.2-inch weapons of the *Good Hope*, yet it did not prove the determining factor. Similarly, neither in the battle-cruiser action in the North Sea nor in the running combat off the Falklands were the effects of the bigger English shells immediately felt. Repeated and well-aimed blows, not lucky shots, appear to have been responsible for the result. Moreover, French naval men do not forget their own experience with the *garde-côtes* of the *Terrible* class that carried originally monster guns of 16.5-inch bore (420 mm.) on so low and unsteady platforms as to be at the mercy of protected cruisers in anything but a smooth sea. In their eyes superiority of caliber, to secure the first hits, must be associated with superior steadiness of platform as well as command and arc of fire, together with superior gunnery. It is fully agreed that such assets are to be found in the *Queen Elizabeth*, which is in advance of all rivals in the matter of engineering appliances as well as of ballistic improvements. But the question does not end there. The number of guns and the probability of hits are being brought in as arguments in favor of such designs as the *Normandie*, *Tourville*, and *Pennsylvania* (twelve to sixteen 13.4 or 14-inch guns), which, assuming they are not out-ranged, could answer the fire of a *Queen Elizabeth* with nearly twice as many rounds in a given time. The point, however, loses somewhat of its value when the much greater smashing power of 15-inch shells is considered. The truth is that France will only abandon reluctantly both the benefit of her quadruple turret and of her improved type of 340 mm. gun.—*J. B. G., Naval and Military Record*, 8/25.

AN EFFECT OF HIGH-EXPLOSIVE SHELLS, described by M. R. Arnoux before the French Society of Civil Engineers, and reported in *Nature*, explains the death without actual wounds of persons near their place of explosion. Evidence furnished by a pocket aneroid barometer exposed to the effects of a German shell shows that the explosion produced, at a distance of 10 feet, a sudden barometric depression of nearly 14 inches, corresponding to a driving velocity of the air of more than 900 feet per second. The suggested explanation of the death of soldiers under such conditions without wounds is that "the air and carbonic acid in solution in the blood are disengaged in the shape of minute gaseous bubbles as soon as the pressure decreases too suddenly from any cause. These bubbles are driven into the small arteries under the influence of the pressure exerted by the heart. If their diameter is greater than that of the small arteries, they form so many gaseous plugs, which instantaneously stop the blood circulation, and death occurs before there is time for them to dissolve back into the blood."—*Scientific American*, 8/21.

THE EFFECT OF A CROSS WIND ON A PROJECTILE IN FLIGHT, BY SECOND LIEUT. H. GILLMAN, R. G. A.—I consider the formula, $W\left(T - \frac{3R}{V}\right)$, Text Book of Gunnery Part I, 1914, suggested by Captain Younghusband, for errors in direction of projectiles caused by a wind force blowing at right angles to the line of fire, is not as accurate as might be; and I put forward the following formula as a much more accurate one:

Let V = Muzzle velocity in f. s.
v = Remaining velocity (striking velocity) in f. s.
R = Range in yards.
t = Time of flight in seconds (in Captain Younghusband's formula this is denoted by T).
D = Lateral drift of projectile due to the wind.
W = Component force of the wind, at a normal to the line of fire, in f. s.

Assume there is no gravity, no air resistance, and no wind; then the projectile would range a distance equal Vt feet, *i. e.*, the muzzle velocity multiplied by the time of flight. But in reality the projectile only ranges $3R$ feet, *i. e.*, the range in feet.

The retardation due to the resistance of the air is therefore:

$$Vt - 3R \text{ feet.}$$

Which may also be reduced to air delay in seconds by:

$$T - \frac{3R}{V}.$$

By Captain Younghusband's argument:

$$D = (Vt - 3R)\frac{W}{V}.$$

He assumes that if the drift for velocity $V = Vt - 3R$ feet, the drift for a velocity of W f. s is proportionate thereto.

If a projectile enters the air with a velocity of V f. s. and has at the end of its range a remaining velocity of v f. s.; the air delay over the range, while the velocity has dropped from V to v f. s. is given in feet by $Vt - 3R$.

But a uniform wind velocity of W f. s. is a constant pressure acting on the projectile, laterally, during its flight, and we cannot compare it proportionally to the velocity of propulsion of the projectile which is not a uniform velocity along the range.

Therefore to arrive at a proportionate air drift, caused by a cross wind, to the retardation due to the resistance of the air along the range, we must compare the wind force to the mean velocity of the projectile during flight.

The mean velocity is given, nearly enough, by taking the mean of the muzzle velocity and the striking velocity; the result however is always slightly too high because for an equal increment of range the percentage change in velocity is less near the end than it is near the commencement of the range. For practical purposes this fact may be ignored, the effect is so inappreciable.

Introducing the mean velocity into the formula we get:

$$D = (Vt - 3R)\frac{2W}{V+v}.$$

This formula gives a larger error in direction, for a given wind velocity, than the formula:

$$D = W\left(T - \frac{3R}{V}\right).$$

The table following is added to show the difference in the error calculated by Captain Younghusband's formula, and by mine.

A component cross wind of 10 f. s. is taken, and a comparison made between a 4.7-inch and 11-inch projectile. The data is taken from the range tables in Text Book of Gunnery, Part I, 1914, pages 112 to 119.

It will be noted that at short ranges, where V and v do not differ much, the formulæ give practically the same results, but the difference is very

marked as the range increases especially with light projectiles which lose their velocity quicker than those of a heavier nature.—*Journal of the Royal Artillery*, July.

Range	4.7-inch Q. F.; M. V. 2150 f. s.		11-inch B. L.; M. V. 2700 f. s.	
	$W\left(T-\frac{3R}{V}\right)$	$(Vt-3R)\frac{2W}{V+v}$	$W\left(T-\frac{3R}{V}\right)$	$(Vt-3R)\frac{2W}{V+v}$
yards	*feet*	*feet*	*feet*	*feet*
1,000	2.0	2.2	0.2	0.2
2,000	7.1	8.4	0.8	0.8
4,000	28.2	37.9	3.2	3.5
6,000	63.3	89.9	7.9	8.8
8,000	105.3	153.1	14.5	16.6
10,000	161.5	236.6	23.8	28.2
12,000	—	—	35.3	42.1
14,000	—	—	49.4	62.1
16,000	—	—	66.8	86.0
18,000	—	—	87.9	115.4
20,000	—	—	111.8	148.9

CEMENT ARMOR BACKING.—It has been decided, after experiment, says the *Army and Navy Journal*, that cement shall be used for the backing of the armor plates of the U. S. battleship *Arizona*, now under construction at New York, in place of teak. The cost of the teak backing of the *New York* was $43,000, and for the *Arizona*, which is a large vessel, the expenditure of at least $50,000 would have been required. The saving in the cost of backing, it is estimated, will be between $25,000 and $35,000. Skilled woodworkers were required to shape and fit the teak. Only cheap labor will be required to pour in the cement behind the plates, and there is another economy without reduced efficiency. The decision of the Navy Department to use cement was the result of experiments by Naval Constructor Robert Stocker, of the New York yard. When the battleship *New York* was near completion last year, Mr. Stocker obtained permission to back four of the plates with cement, the rest of the backing being the sacrosanct teak. When the *New York* arrived at the yard recently the four plates were removed and the backing after a year's trial was found to be in a satisfactory condition.—*Shipping Illustrated*, 8/21.

TO DISSIPATE POISON GAS.—Sir Hiram Maxim has been engaged for some time in devising a means of combating the poison gas of the Germans. He has designed a very simple apparatus which the government is now testing. The object of the apparatus is to cause large and rapidly-spreading fires by means of specially-designed incendiary bombs in the path of the advancing gas at a distance of several hundreds of yards from our trenches, and by this means, since the heating of the air must cause an upward rush, to drive the gas up out of harm's way.—*London Times*, 8/11.

HEAD ARMOR.—Under the conditions of warfare especially prevalent on the western front, which have now endured for many months, and which seem likely to obtain for some considerable time longer, it is almost inevitable that a very large number of the wounds inflicted are in the head. The head is the only part of the body which is most continuously exposed either over the trench parapet or through the loophole, while the head, again, is more likely to receive the shell fragments from a projectile exploding over or immediately in rear of the protective cover which has been thrown up. The French have been quick to notice this, and have now supplied a large proportion of their troops with a metal head-dress, which not

only diminishes the risk of serious head wounds, but makes them more innocuous when inflicted, by lessening the extent of the injury and by preventing the entry of dirt into the wound. From statistics prepared at the Paris Academy of Medicine, it appears that wounds in the head now amount to 13.33 per cent of the whole, while they are further often of a fatal character, not merely when the wounds are penetrating but even when they are superficial, by reason of the infection which frequently accompanies them, and which has been known to occasion a rate of mortality amounting to as high as 57 per cent. There is a certain amount of protection about the sun-helmet such as our men wear in India and are now wearing in the Dardanelles and Egypt, though it is, of course, not comparable to that afforded by a metal head-dress, which would also be unsuitable for a hot climate; but in Flanders the forage cap is not only highly visible, but it cannot be said to provide any protection at all. It seems to us, then, that the question is eminently worthy of consideration, whether we should not supply our men with some kind of armored head-dress, such as would prevent many light wounds altogether, and would reduce the dangerous character of the more serious ones.—*Army and Navy Gazette*, 7/24.

SUBMARINE DEFENCE FOR BATTLESHIPS.—An experiment was conducted at Indian Head, July 20, by the Bureaus of Ordnance and Construction and Repair with a large $25,000 caisson representing an entire new design of hull, which it is believed will increase the defence of battleships against attack from submarines. One of the largest type torpedoes was discharged against the caisson to test the strength of the new design for the under water construction of warships. Of course, the results of the test have not been made public, and probably will not be. If the new design is used in the building of battleships its character will be carefully guarded by the authorities. Eventually it may become known, but not until after the new ships are built. This is the third time ordnance experiments of this character have been made by the naval authorities. As a result of the previous experiments there have been important changes in battleship construction, and it is not thought that this experiment will prove to be an exception. This is only one of the plans that the Navy Department is working on to solve the submarine defence problem.—*Army and Navy Journal*, 7/24.

KINEMATOGRAPHY OF PROJECTILES.—A method of photographing moving projectiles by daylight, with a modified motion picture camera, is described in a note which *Prometheus* quotes from *Photographische Korrespondenz*. By using a rotary shutter with three open sectors, instead of one, three photographs of the projectile are impressed on the same segment of the film, during a single pause of the film, which has a width of 4.8 inches, about four times the usual width. It is possible to shorten the exposure to 1/2400 second, if the lens is very sensitive and the projectile contrasts strongly with the background. In this way the inclination of the projectile and of its path at the beginning and end of its flight can be determined. The initial and final velocities can be measured by including a moving clock hand in the picture. For the precise determination of the positions of the projectile near the beginning and end of its flight it is photographed in two mutually perpendicular planes with two cameras. By using a camera with four lenses, each covering a quarter of the width of the film, and an ingeniously constructed shutter, several phases of the emergence of the projectile from the muzzle can be photographed. These data are of weight in ballistics.—*Scientific American*, 8/7.

ENGINEERING

NEW TYPE NAVY BOILER.—The eight boilers recently purchased by the Navy Department under Navy Schedule 7865, class 141, have been delivered by Charles L. Seabury & Company, of Morris Heights, New York City, after passing every test. Four of these boilers are illustrated in figs 1 and 2. They are of the Seabury safety water-tube type, designed to operate under 165 pounds steam pressure, though a hydrostatic pressure of 500 pounds was successfully applied. The dimensions are as follows:

Length of casing, 4 feet 3½ inches; width, 4 feet 4 inches; height, including ash pan, 5 feet 6½ inches; grate surface, 12.5 square feet, and heating surface, 240 square feet. The upper or steam drums were of 15 inches

FIG. 1

FIG. 2

outside diameter, lap-welded steel plate ½ inch thick, and the lower or mud drums were of the same material, 8⅝ inches outside diameter, and 5/16 inch thick. The generating tubes were of 1 inch O. D., No. 12 B. W. G. of seamless drawn steel cold bent to shape.

The boilers were fitted with flanges, in accordance with the Bureau of Steam Engineering Standard Flange List No. 8-A, and complete with fittings and casing, weighed each, dry, 3800 pounds.—*International Marine Engineering*, September.

AERONAUTICS

AERIAL COMBATS REPORTED BY SIR JOHN FRENCH.—Since my last despatch there has been a considerable increase both in the number and in the activity of German aeroplanes in our front. During this period there have been more than 60 combats in the air, in which not one British aeroplane has been lost. As these fights take place almost invariably over or behind the German lines, only one hostile aeroplane has been brought down in our territory. Five more, however, have been definitely wrecked

behind their own lines, and many have been chased down and forced to land in most unsuitable ground. In spite of the opposition of hostile aircraft and the great number of anti-aircraft guns employed by the enemy, air reconnaissance has been carried out with regularity and accuracy.—*United Service Gazette*, 7/22.

AVIATION EXPLOITS.—A squadron of ten French aeroplanes dropped 46 shells of 75 mm. and six heavy bombs on the railway station of Chauny, where important depots of material are concentrated. The outbreaks of two fires were noticed. A barge blew up on the canal of the Oise.

A French aeroplane pursued an Aviatik and brought it down with machine gun-fire. The machine, which was in flames, fell in the German lines near Soissons. Its destruction was completed by artillery.

One of the French dirigibles dropped 23 bombs on the military railway station and on an ammunition depot at Vigneulles les Hattonchatel. A squadron of six aeroplanes on Tuesday morning bombarded Colmar Station. Eight 150 and eight 90 shells were dropped on the railway buildings and trains. Damage was ascertained at the main railway station and at the goods station. No shells were dropped on the town. The aeroplanes returned safely.

Thirty-one French aviators on Tuesday bombarded the railway station of Conflans in Jarny, an important junction. Three shells of 155 mm. and four of 90 mm. were observed to have been neatly dropped on the station. The engine shed was struck by a shell of 155 mm. Three Aviatiks were put to flight by French pursuing aeroplanes which accompanied the squadron. One Aviatik was compelled to land rapidly.

During the night of July 16 two Italian dirigibles bombarded the enemy's works around Gorizia and the enemy's camps on the northern slopes of Mount San Michele, in Carso, with satisfactory results. The dirigibles, which were continually lit up by the enemy's flares and made the object of heavy artillery fire, returned safely to their lines at daybreak.

The Petrograd correspondent of the *Morning Post* states that on Sunday a Russian dreadnought Sikorsky aeroplane was out scouting when three German aviators attacked from above, below, and from one side. Some accident prevented the Russian plane bringing its full armory to bear, but one of the German machines approaching too near was so badly damaged by the Russian fire that it fell headlong. The Sikorsky plane had several of its motors and one of its propellers put out of action, besides receiving no fewer than 16 holes in its benzine tanks. Considerable damage was also done to the stays and stringers. The captain of the plane was twice wounded, and one of the crew had both hands frozen in endeavoring to stop the leaks in the benzine tanks at the great height at which this aerial battle was fought. The Russian plane when attacked was over two miles above the ground, an altitude at which the summer weather, even so far south as the neighborhood of Krasnostav, where this occurred, had no effect on the temperature, and the cold was increased by dealing with evaporating benzine. The Russian plane reached home again in spite of its serious injuries, which would have destroyed twice over any other form of heavier-than-air machine yet known.—*Army and Navy Gazette*, 7/24.

GERMANY'S PROJECTED GIANT AEROPLANES.—Not long ago there appeared a notice in Swiss papers saying that England was building aeroplanes of immense size, able to carry 16 men. The *Scientific American* is informed that Germany will soon begin the construction of similar aeroplanes (triplanes) of enormous dimensions. These machines are to be *three times as big and strong* as the ordinary flying machine. They are to carry as many as 20 men. This crew has to work four machine guns and one light field piece mounted in a special little armored turret. Eight Maybach motors, similar to those used by the Zeppelin airships, are to drive the apparatus through the air. The motors are coupled in pairs and drive four propellers.

The propellers may be shifted in position so that they serve for steering in a horizontal plane. Manual steering is resorted to only for elevating or depressing the machine. All other movements are effected by the motors. The triplane will fly with two propellers only, if need be, and travels at high speed when four are turning. The machine is armored.—*Scientific American*, 8/7.

WOUNDED AEROPLANES.—The wings of an aeroplane work surprisingly well when they are riddled with bullet holes. It is usually assumed, says *Prometheus*, that the sustaining power of a plane is proportional to its area, but it is known that the shape is also an important factor, and it is evident that the injurious effect of holes is not proportional to the diminution in area produced by them. The wings of birds are permeable, especially when widely extended. The efficiency of ships' sails is not much affected by holes, and Vassalo in 1894, experimentally proved to his own satisfaction that sails are improved by perforations. Even injuries to the motor of an aeroplane are less dangerous than would naturally be assumed, provided that the pilot retains control of the vessel. He can descend by gliding and can advance nearly four miles in a descent of one mile.

THE "ARK ROYAL."—Isolated experiments, of course, had been made as to the launching of seaplanes from a battleship's deck, but the attack on the Dardanelles produced an unheralded novelty in the shape of a vessel

THE "ARK ROYAL," THE BRITISH AEROPLANE SHIP WHICH OPERATES WITH THE ALLIES' FLEETS AT THE DARDANELLES

devoted solely to the carrying of aircraft. This was the *Ark Royal*. Originally designed as a cargo steamer, she had the front half cut entirely away, leaving a long and wide level platform. The aeroplanes employed were stowed in the hold, and being either of the *Scout* type, with only 20 feet spread, or the *Short*, with folding planes, they could be hoisted without previous dismantling, and once on deck could take to immediate flight. The appearance of the *Ark Royal*, in its semitruncated form, is decidedly novel. Of course, there are many other seaplanes of a larger type which

could not be disposed of in this way; one of the largest is the Curtiss "flying boat," and the British Admiralty has not only several examples of this well-known American machine, but it has also been adopted by other countries.—*Scribner's,* July.

CURTISS BRINGS OUT A NEW WAR-PLANE.—A new Curtiss aeroplane, built especially for war purposes, and capable of carrying three passengers, besides the pilot, was tried out at Buffalo, N. Y., recently, and made a most excellent showing, easily breaking the American records for climbing with passengers, and apparently capable of great speed in ordinary flying. With two passengers an ascent of 8200 feet was made in 27 minutes, and with three pasengers a considerably greater elevation was reached, equally as fast. In this second climb, with a total live load of 800 pounds, a height of 8300 feet was quickly attained, when the barograph stopped recording. The ascent was continued for another five minutes before the descent began, and those who observed the flight are confident that, with the same load, another 4000 feet could be accomplished. The American record for height, with two passengers, is 5187 feet, and the world's record with three passengers is held by an Austrian aviator, who ascended 15,650 feet last year. This new machine is of the tractor type, with the passengers located in a cockpit in front of the pilot, who sits behind the planes. The engine develops 160 horse-power, and the machine is capable of carrying a load of 1500 pounds dead weight. It is capable of flying at great speed with full load, and it is believed that the requirement of climbing rapidly from the ground with its load has been most satisfactorily met. Its control appears to be very perfect, for it is said that in these tests, the pilot flew at a speed of 94 miles an hour without touching the wheel. Further altitude tests will be made as soon as a barograph of greater capacity is secured. (See frontispiece of War Notes.)—*Scientific American,* 8/28.

LIFE SAVING DEVICE FOR AVIATORS.—A member of the British Embassy at Washington, says a newspaper dispatch, has recently sailed for England with a new life-saving device for aviators. It is in the form of a parachute and was invented by an American naval engineer. The apparatus is described as being so constructed that, a man's weight being known, he can be equipped with an appliance to land him at a desired speed. Calculations show, according to the inventor, that from 500 feet in the air the aviator would land with the force of a man jumping from a 10-foot wall.—*Engineer,* 8/20.

THE ZEPPELIN.—Very precise information is at hand regarding the useful load of the 1913 class of Zeppelins. The log-book of the *Z 4* (the one that landed involuntarily in France) showed upon examination that this ship, which displaced only 688,000 cubic feet, had a carrying capacity of 10,600 pounds, made up as follows:

Crew (twelve men)	1,920 lbs.
Fuel (for twelve hours)	3,780 lbs.
Ballast	3,500 lbs.
Armament (replaced by ballast)	1,400 lbs.
Total	10,600 lbs.

A fuel capacity of twelve hours at 35 knots gives a cruising radius of 420 nautical miles. London being 300 miles from the nearest Zeppelin base (Cologne) the projected aerial invasion would be a thing utterly impossible with this class of airship. In order to increase the cruising radius of the Zeppelin, the 1914 class was given a greater displacement, which was obtained by lengthening the 1913 type through the addition of two balloon

sections whose lift increased the useful carrying capacity by 3400 pounds. This was utilized as follows:

Crew (four more men)	640 lbs.
Fuel (eight more hours)	2,520 lbs.
Ballast or explosives	240 lbs.
Total	3,400 lbs.

The increase of the crew became necessary for two reasons: firstly, because all the preceding Zeppelins were undermanned in peace time, there being no provision made for the men required to operate the guns, the bombs and the searchlights; secondly, owing to the difficulty of handling a larger sized airship on a longer cruise.

The above figures give the 1914 military class a cruising radius of 700 miles, *i. e.*, a distance just sufficient for a trip over land and sea from Cologne to London and back.—*Scientific American, Army and Navy Gazette*, 7/31.

RADIO

GERMAN WIRELESS.—At the annual meeting of the Marconi Company on July 26, the managing director made a remarkable statement illustrating the foresight of Germany in regard to matters which were likely to be of assistance to her in such a war as she now finds herself engaged in. As everyone knows, five years ago the Marconi Company applied to the British Government for the right to erect high-power wireless stations in all the British possessions. Subsequently the scheme for the Imperial wireless chain was evolved, and a contract proposed in July, 1912, between the government and the Marconi Company for the provision of stations at London, Egypt (or Cyprus), Aden, Pretoria, Bangalore, and Singapore. The Marconi scandals, as they were called, which led to the appointment of a Select Committee, delayed the plans for a whole year, and also altered their character. But while this was going on, we are now shown what the Germans did. They decided secretly to build a chain of stations in their colonies. The matter was not discussed in Parliament. The stations were built, the German Government paying about three times as much for each of them as the Marconi Company had asked the British Government, and offering a more generous subsidy. The total cost of building, in fact, is estimated at £2,000,000 sterling. Since the war all these stations have been destroyed or captured by Great Britain, and it might be supposed that from the German standpoint they were bad investments. But their value in the first moments of war more than recompensed the Germans for their cost. At 5 p. m. on August 4, six hours before a state of war between Britain and Germany came about, a message was sent from Berlin through all the German colonial stations, covering a radius of 2000 miles or more, to this effect: "War declared upon England; make as quickly as you can for a neutral port." By this message Germany contrived to save the greater part of her mercantile marine. If she had only saved one of her big ships, such as the *Vaterland*, the value of such a vessel would have paid for the whole cost of the wireless stations. But Germany did more. She encouraged her wireless company to create powerful agencies in nearly every country in the world, knowing that a German station would mean German hands to work it, a useful condition of affairs in case of war. Looking back, we see how this policy served its promoters in South America, and even in the United States, where the Sayville station has recently received attention at the hands of the American Government. In short, the relative progress of British and German wireless installations within the past five years affords another instance of the fact that our rulers were indifferent to the possibility of a great war, while those of Germany were quietly preparing for it.—*Army and Navy Gazette*, 7/31.

INCREASING WIRELESS RANGE BY KITES.—The recent maneuvers in northeastern Massachusetts were of particular interest because of successful experiments by the signal corps in maintaining a wireless aerial at a great altitude by means of kites, and thereby increasing the efficiency of an ordinary field radio set from 6 to 16 times. At the invitation of Adjutant General Cole of the Massachusetts Volunteer Militia, Samuel F. Perkins, a maker and flyer of man-lifting kites, went to Newbury and experimented with the signal corps. As there happened to be fairly strong winds at the time, Mr. Perkins was able to send up a string of kites to a height of 1600 feet. The messages transmitted from the kite-supported aerial are said to have been received 150 miles away with distinctness, although the field wireless set used would only transmit messages 25 miles ordinarily. The results were obtained because the kites flew so steadily that the aerial was always maintained at a constant altitude. The receiving qualities of the kite-supported aerial were remarkable. The messages were received from the battleship *Georgia* off Newport, and from the government stations at Arlington, Va., and Bermuda. Code messages being exchanged between two British warships out in the Atlantic Ocean were received with accuracy. Further experiments by the United States Government and Marconi officials are now being conducted, and it is expected that in a short time the range of sending from an ordinary field wireless set will be increased.—*Scientific American*, 8/28.

CANALS

SUCCESS AND FUTURE OF PANAMA CANAL.—Summing up the history of the Panama Canal for the first year from its opening, August 15, 1914, Winthrop L. Marvin tells us, in the September number of the *American Review of Reviews*, that the tonnage passing through the Canal upon which tolls are based was 4,404,364 during the year. The tolls amounted to $4,434,383 and the actual cost of operation to $4,112,550. Of the tonnage 1,416,294 tons was American coast-to-coast tonnage. In addition other American cargo vessels made a certain number of foreign voyages, particularly in the trade to and from the west coast of South America. The chief foreign tonnage has been tramp steamers from Australasia, the nearer edge of the Far East, and the west coast of South America for Europe and the Atlantic coast of the United States, and ships outward bound from Europe and the Atlantic coast on the reverse routes. It was too hastily assumed, Mr. Marvin tells us, when Congress in 1912 barred the Canal to all vessels in which transcontinental railroads had any interest, that the volume of American shipping at Panama would be heavily reduced by this summary exclusion of "the richest and most powerful transportation companies in America." But fortunately there were resourceful men who were shipowners and nothing else, wholly without railroad affiliations, and they went boldly ahead to build or buy or charter steamships fit for the 6000-mile passage from New York or Boston to Puget Sound—in fact a large fleet was instantly available in the ships of coast-to-coast services already operating by transfer via the Isthmuses of Tehauntepec and Panama, or over the long old route through the Straits of Magellan. Even if war had not come, the American steamship companies would have been found to be far more thoroughly prepared with ships, terminals, and immediate plans for the full use of the Canal than the shipping managers of Europe. But significantly there is not one American steamship service that goes through the Canal and out upon the Pacific to South America, Australia, or the Orient. Our shipping laws make competition with foreign ships on the open ocean impossible. The Japanese pay $8 per month for seamen and firemen where American ships are compelled by the La Follette law to pay $35 to $55 per month. Besides this the Japanese Government pays a subsidy or bounty more than suffi-

cient to pay the tolls through the Canal of Japanese ships. These brief, hard facts—wages and tolls—explain why not one American steamship has been or is being built for Panama-Pacific international commerce.

In an able article entitled "The Future of the Panama Canal" in the *Outlook* for August 25, Prof. George H. Blakeslee, professor of History and International Relations at Clark University, concludes that with a sufficient garrison for the Isthmus our possession of the Panama Canal can be made secure. "While more work needs to be done on the forts," says Professor Blakeslee, "most of the guns are now ready for use, and the necessary supply of ammunition, according to Colonel Goethals, is already on the Isthmus. In case of early war, then, the present defences could probably stand off a hostile fleet, while the garrison could repulse an ordinary landing force of marines from any suddenly arrived hostile squadron. This system of defence makes the Canal reasonably safe except from an attack by a relatively large body of soldiers. If there is any apprehension of this, the Canal would need to be strongly and immediately reinforced from the United States, for the present garrison would then be totally inadequate." Professor Blakeslee thinks the chief danger to the Canal is found in the ambitions of Germany, "unless the nations shall be able to do away with the present competitve militarism by the formation of some league for mutual defence or by a stringent limitation of armaments, there will probably be a serious clash of interests between Germany and the United States in the region of the Panama Canal. It will be Germany's interest to secure a naval base in the important greater Canal Zone; it will be ours to prevent it."—*Army and Navy Journal*, 9/11.

THE U. S. BATTLESHIPS IN THE PANAMA CANAL.—The recent passage of the United State battleships through the Panama Canal, on their way to the San Francisco Exposition, while impressive, was by no means sensational as the trip from the Atlantic to the Pacific was accomplished without particular incident or accident. The vessels entered the Canal at Cristobal on Friday, July 16, and the passage was made almost without a halt, except for passing the locks. An interesting feature of the event was a demonstration of the efficiency of the great locks, for, at both Pedro Miguel and at Miraflores, a double lockage was effected, two of the ships going into one of the twin locks together, while the third vessel was accommodated in the adjoining lock. This enabled the ships to maintain fleet order all the way through the Canal, and they steamed out into the broad Pacific in proper and orderly formation.

The safe and rapid passage of these vessels, the first war fleet to make use of the Canal, has probably added greatly to the appreciation by the public of the value of this great waterway.—*Scientific American*, 8/21.

MISCELLANEOUS

FOR OBSERVING SUBMARINES.—John Gardner, of Fleetwood, England, the inventor of the Gardner submarine signalling system, has devised a method which promises to overcome the difficulty of keeping a lookout for submarines as he insures that the observer, comfortably seated, with his telescope supported on a stand in front, can be certain that the telescope or binocular glasses will always be approximately parallel to the surface of the sea, irrespective of the movement of the ship which frequently interferes with the accurate observation of the periscopes of underwater craft. The inventor achieves this end by mounting a pedestal securely to the deck and on this is carried the seat, with the table to support the telescope or binoculars on a standard. The seat and table are maintained in a truly horizontal position relative to the sea-surface by the operation of a gyroscope.—*Marine Journal*, 8/7.

THE "LUSITANIA" FINDING.—Lord Mersey on Saturday last delivered the judgment of the court constituted by the Board of Trade to inquire into the loss of the *Lusitania*. Some of the salient points in the judgment were as follows:

There were no troops on board. There were instructions received by the master as to the navigation of the vessel, and, in answer to the question, "Did the master carry out such instructions?" the court replied in the negative in regard to some of them. There were messages sent and received by the *Lusitania* with reference to enemy submarines during the voyage. The ship was attacked by a German submarine which displayed no flag. She was not armed. She was struck by two torpedoes practically simultaneously. After she was struck there were reasonable and practical measures taken on board to save life. None of the loss of life was due to neglect by the master. The loss of the *Lusitania* and the loss of life was caused by the sinking of the ship by torpedoes from the submarine, and was not caused by any wrongful act or default of the master. No blame attached to the owners. All the requirements of law were fulfilled and the life-saving appliances were satisfactory. The officers and men behaved well, and more than half the crew lost their lives. The 5000 cases of cartridges on board were stowed 50 yards from where the torpedoes struck the ship, and there was no explosion on board other than from the torpedoes. The ship sailed with six boilers closed down, speed being reduced to 21 knots. That reduction was of no signficance, and was proper. The captain took proper precautions when the danger-zone was reached, speed being reduced to 18 knots on the morning of the catastrophe to secure the ship's arrival at Liverpool about four next morning.—*Army and Navy Gazette, 7/24.*

WORK ON THE SUBMARINE "F 4."—The following statement by Stephan Drellishak, one of the five U. S. Navy divers who were hurried to Honolulu when the news of the disaster was first received, is interesting. When the divers reached Honolulu, he says, the *F 4* had been located about a mile and a half outside of Honolulu harbor, in the open sea, where heavy swells were constant, in 305 feet of water. The divers in the party were George Stillson, Frank Crilley, Frederick Nielson, William Lockman and Drellishak. They took turns in descending to fasten cables about the submarine. The work was not one of merely pulling the boat along on the bottom, but keeping her suspended by the cables between two scows and the gradual towing of the scows toward shore. The work was necessarily very slow, as the heavy ocean swell interfered with keeping the cables in place.

Only one diver went down at a time, and he was rarely able to stay more than 20 minutes at the bottom. This brief space under the sea at the depth of 305 feet, with a pressure of 138 pounds to the square inch, completely exhausted the man, and perhaps he would not be able to go down again for two days. All suffered at different times from the "bends," but mostly in a mild form. At each trip it took three hours to return to the surface. The diver could have been raised quickly enough to the surface, but the sudden transition from the high pressure at the bottom to the atmospheric pressure of 14.7 pounds at the surface would have entailed probably a fatal attack of the bends. To get down to the bottom generally took about four minutes. In ascent part of the three hours was spent in being elevated 10 feet at a time, and being kept at each 10-foot elevation a period of six or eight minutes. During one of these elevations Diver William Lockman became fouled among the cables attached to the submarine, when he was 275 feet below the surface. It was four hours before he could be released, and no diver had ever remained so long at such a depth. When he was brought to the surface he was semi-conscious. He had been pulled to the surface quickly when released, which could not be avoided. For nine hours he was kept in the recompression chamber aboard

the tender and was badly exhausted when it was all over. He went down subsequently with an attack of pneumonia, but rallied and recovered.

It was when the sunken submarine had been dragged to within a mile of shore, and was in only 45 feet of water, that the accident occurred that terminated the methods of the expedition. Ocean swells had been the greatest source of annoyance, as they lifted the submarine and dropped it again, sometimes heights of 10 feet. The steel cables held, but fears were constantly entertained that the extra upward pressure would cause some of them to cut through the shell of the submarine. This ultimately happened. A cable cut through the forward part of the little vessel, tearing a hole large enough in the body for a man to enter. The divers wished to enter and make an investigation, but the Department decided that it might disturb some of the valves or apparatus and prevent a subsequent examination from determining the exact source of the boat's sinking. The divers were ordered home, while a rush order for special equipment was sent to Mare Island.—*Army and Navy Journal*, 9/11.

THE DECLINE OF OUR MERCHANT MARINE.—The object lesson of the results of the lack of an American merchant marine in the overseas trade, so vividly brought home to the people of the United States during the existing conflict between the great European nations, involving as opponents the two greatest international maritime carriers, Great Britain and Germany, and the fact that so many British ships have been withdrawn from the world's carrying trade to meet the needs of government service and the merchant fleets of the Germans have been driven from the seas, has set this whole nation thinking as to how to devise means for the restoration of our American merchant marine. It is true our pride was hurt when the American fleet of warships on its recent trip around the world was obliged to be accompanied throughout its entire journey by a host of the merchant ships of foreign nations converted into auxiliaries, colliers, and supply vessels, but this did not have the disastrous effect of crippling our agricultural, industrial and commercial interests. The dislocation of our internal economic affairs incident to the present war has demonstrated the necessity for this country to develop its overseas transportation facilities to as high a point of efficiency as it has already developed its agricultural and industrial organization. It is absurd to expect that the United States will continue indefinitely in the status of a nation carrying less than 10 per cent of its exports and imports in ships flying its own flag, thereby rendering itself liable to calamitous commercial effects when international disturbances arise in which we are not participants and over which we have no control.

The recollection of our past performance should be sufficient to stimulate us to free ourselves from such a condition of commercial servitude. In 1861 the United States and Great Britain ran neck and neck for supremacy as the great international carriers of the world, the tonnage of the former being 5,482,127 and of the latter 5,895,369. We have been prone to attribute to the Civil War our decline as an international carrier. It is curious, however, that since 1870, five years after the conclusion of hostilities between the states, Germany, which previously had almost no merchant marine, gradually took the place of the United States as the rival of Great Britain in this respect, and this has admittedly been accomplished by the efficient work of her legislative and administrative machinery combined with the enterprise of her shipowners. The inference is inevitable that we have been lacking in either or both of these factors.

Our shipowners have persistently asserted that the natural and artificial handicaps against them have been so great that it was hopeless for them to expect to recapture the share of this trade to which the United States is entitled, overseas carriage being a bargain in which no one nation can assume successfully to dictate all the terms. As evidence of their ability successfully to perform their part of the undertaking, where not unduly

handicapped, they point with pride to their magnificent fleets of large steamers trading all over our enormous extent of seaboard on both the Atlantic and the Pacific oceans and on the Great Lakes, aggregating nearly seven million gross tons, on routes many of which extend to several thousands of miles, and which alone rank this country as easily the second maritime nation of the world. They have also as persistently asserted that had the United States Congress assiduously addressed itself to the undertaking, a solution of the problem would have been evolved long ago; and, moreover, that not the least of the handicaps which have strangled their efforts have been those imposed upon them by governmental action or by the lack of such governmental support as has been given by both Germany and Great Britain to their merchant marine.—*Scientific American*, 7/14.

MARINE TONNAGE STATISTICS.—The most notable changes in the statistics of tonnage owned in the various maritime countries since the war, as published in the new 1915-16 Lloyd's Register Book are as follows:

	1914-15 Register	1915-16 Register		
British Empire	21,045,049	21,274,068	+	229,019
Germany	5,459,296	4,706,027	—	753,269
*U. S. A.	5,368,194	5,892,639	+	524,445
Norway	2,504,722	2,529,188	+	24,466
France	2,319,438	2,285,728	—	33,710
**Japan	1,708,386	1,826,068	+	117,682
Italy	1,668,296	1,736,545	+	68,249
Holland	1,496,455	1,532,247	+	26,092
Sweden	1,118,086	1,122,883	+	4,797
Austria-Hungary ...	1,055,719	1,018,210	—	37,509
Russia	1,053,818	1,054,762	+	944
Spain	898,823	899,204	+	381
Greece	836,868	908,725	+	71,857
Denmark	820,181	854,996	+	34,815
Belgium	352,124	276,427	—	75,697

*Sea, Lake and Philippines. **Exclusive of sailing vessels.

—*Shipping Illustrated*, 8/21.

AERO-RADIO SYSTEM OF NATIONAL DEFENCE.—By John Hays Hammond, Jr. Those of us who are watching the great world conflict are forced to the conclusion that the individuality and the rights of a nation exist only when backed by national preparedness. The class of people who disavow this are one with the ostrich which buries its head in the sand.

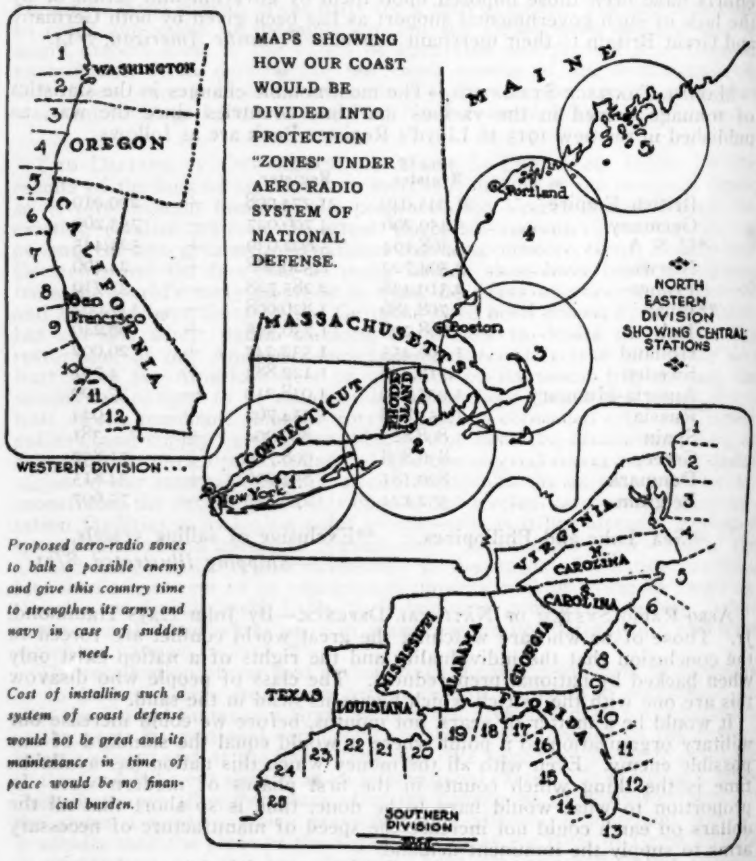
It would be a matter of years, not months, before we could increase our military organization to a point where it would equal the standard of our possible enemy. Even with all the money which this nation has available, time is the thing which counts in the first phases of modern war. In proportion to what would have to be done, time is so short that all the dollars on earth could not increase the speed of manufacture of necessary arms to supply the imminent demand.

The training of the men to handle the most elaborate mechanisms on earth—torpedoes, guns, submarines and aeroplanes—is not a matter of a week or of a month; it is, as Europe has shown us, a matter of years.

In view of the fact that our power will be comparatively limited during the next few years, even with the most energetic work in strengthening our situation, it is essential that we exert every effort in the devising of methods for employing what strength we have in the most efficient way.

It is my belief that by applying radio systems to aeroplanes and the stablishment of aero-scouting districts or areas along our seaboard, we can provide for our country an invaluable unit of defence.

It must be borne in mind that our coast line is so extensive and our navy at present of such small size and comparatively slow speed, that it is essential for us to develop scouting facilities of extraordinary efficiency. With a scout system such as I will outline, our land forces could co-operate with out fleet in preventing landing operations on the part of an enemy. Aerial information would be the only sort by which the intent of the enemy's maneuvers and the ultimate objective could be ascertained. And, having this information, our nation could use to best advantage the limited force which it now possesses.



Proposed aero-radio zones to balk a possible enemy and give this country time to strengthen its army and navy in case of sudden need.

Cost of installing such a system of coast defense would not be great and its maintenance in time of peace would be no financial burden.

As in any conflict with a great power we shall have the smaller force, we must be able to use the maximum energy of the force, and it must be used at the point of impact or attack.

In order to give us the facility so to use our force, I suggest a rough plan for the organization of a system the business of which shall be the patrolling of our coasts to obviate a surprise attack at any point thereon.

To make my proposal more clear, I have prepared the three accompanying maps to show the scouting areas to be patrolled by aeroplanes along our coasts.

On the one showing the northeastern division of our coast line there are five areas, each of 50 miles radius, which constitute the patrol areas for five aero scouts. In each of these areas I have indicated a radio receiving station which is connected by land lines with the other stations.

Each of the aero scouts will be equipped with a radio transmitter of 60-mile daylight radius. He will not have the receiving apparatus, as the noise of his motor and propeller would be too great to permit him to hear. While aloft each of the scouts would be in constant communication with his central radio station, which in turn is connected with the existing land system by telephone or telegraph.

Scouts covering such an extended front would be able to discover and report upon the movement of an enemy's ships, their number and disposition and their strategic formation. Then, equipped with such valuable information, it would be comparatively easy to concentrate our forces at decisive points to meet the invader.

The maps I have prepared show that 44 aero scouts could cover the coasts of our country. Let us look at the figures these 44 would represent; in other words, the amount which would be required to furnish them as an arm of defence.

Aeroplanes cost approximately $7500 apiece, so that the cost of them would be $330,000. Radio transmitters and receivers at $200 apiece would mean a total of $8800. The receiving stations and aeroplane sheds, costing $600 each, would total $26,400. The receiving aerials and masts, at $250, make a sum of $11,000, and then there is a final sum of $22,300. This makes a grand total of expenditure of $398,500.

This would, I think, be a generous sum, as it is obvious that a number of existing radio and receiving stations could be used. It is my opinion that the Chaffee system of wireless telephony would be the best one to use, as it is simple of operation, compact, light, and requires no knowledge of the Morse code. It gives large power in small aerials, is capable of being sharply tuned, and is cheap in construction.

The great problem in war is to engage the enemy at decisive points with overwhelming forces, to concentrate all energy available to deliver the knockout blow on the enemy's vital spot. To ascertain the enemy's plans in order to meet his attacks with superior power at the right place, to concentrate our forces and to control their disposition, we must depend upon the eyes and the nerves of the military organization. The wonderful eyes to-day of the army and navy are the aeroplane and dirigible. The nerves transmitting the intelligence from the eyes are the wireless, line telegraph and other signalling systems. The brain is the general staff controlling the operations of the armed forces.

In view of the fact that we have an immense coast line and an inadequately small navy, it is necessary that we shall have a patrol system of our coastal line to assist in the most efficient placing of our limited forces to meet the enemy. In these days where battle lines are hundreds of miles long it is impossible to judge the big plan of the enemy's movements from watching one army corps or a flotilla of his ships. It is the combined reports of many scouts scattered over a broad front that reveal the big plan of action.

In the patrol of our entire coast line by aeroplanes, Washington will be connected by electrical nerves to a number of small wireless receiving stations placed along the coast. Each wireless station will be in radio touch with an aeroplane eye patrolling within a certain specific zone. Like the police system, each aerial patrol will have its beat, and when there is trouble he will, so to speak, ring in by wireless.

Each zone would have a diameter of 100 miles, and as the wireless receiving station would be centrally placed, the radio set on the plane need only transmit about 60 miles (daylight conditions) in order to keep the patrol in touch with the receiver.

To cover our coast line, it would be necessary to have 44 aeroplanes and 40 small portable houses, each with an aerial mast about 80 or 90 feet high. The house would be used as a receiving station and an aeroplane hangar. The wireless receiving equipment would be portable and the whole system would be operating in war conditions. The maintenance of the system in time of peace would be practically nothing, and placing it in operating shape would require no appreciable time. To man the system properly it would require three shifts of aviators, or 132 men, and 40 telegraphers. By introducing the wireless telephone and land phone experts in this line could be done away with.

NAVAL LESSONS OF THE WAR

NAVAL INVENTIONS BOARDS.—*France First to Profit by this Idea.*—In view of the decision of the British Government to appoint an Inventions Board with the object of encouraging scientists and others to assist the Admiralty in the invention and perfecting of weapons of war, it is an interesting fact that the French naval authorities, who were among the first to recognize the potential value of underwater craft, decided 20 years ago to supplement the efforts of those working directly under the government by inviting the co-operation of naval architects outside. One of the results of that decision was to bring into prominence M. Laubeuf, who submitted competitive designs for a submarine boat not exceeding 200 tons displacement, and who has since won such a high place among the designers of underwater vessels.—*Naval and Military Record*, 7/14.

THE BRITISH BOARD.—*Lord Fisher's Colleagues.*—It was announced on July 5 that Admiral of the Fleet Lord Fisher of Kilverstone had been appointed chairman of the Inventions Board established to assist the Admiralty in co-ordinating and encouraging scientific effort in relation to the requirements of the naval service.

The arrangements for the organization of the board have now been completed. It will comprise a Central Committee and a Panel of Consultants, composed of scientific experts, to advise the main committee on questions referred to them.

The Central Committee will consist of:

Lord Fisher of Kilverstone, G. C. B., O. M. (president).
Hon. Sir C. A. Parsons, K. C. B., F. R. S.
Sir J. J. Thomson, O. M., F. R. S.
Mr. G. T. Beilby, F. R. S.

Consulting Panel: Prof. H. B. Baker, F. R. S., Chemist; Prof. W. H. Bragg, F. R. S., Physicist; Prof. H. C. H. Carpenter, Metallurgist; Sir William Crookes, O. M., F. R. S., Chemist and Physicist; Mr. W. Duddell, F. R. S., Engineer; Prof. Percy Frankland, F. R. S., Chemist; Prof. Bertram Hopkinson, F. R. S., Engineer; Sir Oliver Lodge, F. R. S., Physicist; Prof. W. J. Pope, F. R. S., Chemist; Sir Ernest Rutherford, F. R. S., Radium expert; Mr. G. Gerald Stoney, F. R. S., Engineer; Prof. R. J. Strutt, F. R. S., Physicist. This board may be added to.

Naval Sub-Committees.—It is understood that in addition to the Consulting Panel, the Royal Society has offered its services for the purpose of investigation and development of proposals which have been provisionally accepted from inventors. For preliminary examinations, also, sub-committees of naval officers will be appointed to examine suggestions and plans in order that technical knowledge and experience shall be brought to bear on these matters in the initial stage. Schemes or ideas for the advancement of gunnery, torpedoes, engineering, ship-design, aviation, submarines, and any branch of naval science and material for attack or defence will be dealt with by the board.

The board is accommodated temporarily in the Whitehall Rooms, Hotel Metropole, Whitehall Place, S. W., but at an early date will be transferred to permanent offices at Victory House, Cockspur Street, S. W. Communications should be addressed to the secretary, Board of Invention and Research.—*Army and Navy Gazette*, 7/24.

NAVAL INVENTIONS.—The composition of the new Board of Invention and Research for the navy, is such as to inspire confidence in its authority and work. To describe the Central Committee in a word, it is a *practical* body. This is not only what it ought to be, but what the nation expected and was determined it should be. In such a matter there could be no room for a large executive organization, containing perhaps a proportion of figureheads or ornaments. This would have defeated the object of Mr. Balfour in starting the new undertaking. Lord Fisher, than whom no one knows better what is looked for from the board, has, however, selected for his chief colleagues three men in Sir J. J. Thomson, the Hon. Sir C. A. Parsons, and Dr. G. T. Beilby, whose records and abilities in their respective spheres are known to everyone. Sir Joseph Thomson has been Cavendish Professor of Experimental Physics at Cambridge for over 30 years, and Professor of Physics at the Royal Institution, London, for ten years. Sir Charles Parsons, of the well-known engineering firm of that name, has developed the steam turbine, and made it practicable for the generation of electricity and the propulsion of warships and merchant steamers. Dr. Beilby is a scientific director of chemical works at home and abroad, an inventor of many industrial processes, and a chemist who has made a special study of fuel economy. Associated with the Central Committee on which the admiral, the physicist, the engineer, and the chemist have thus been brought together is a Consulting Panel which at present contains the names of 12 scientists and to which additions may be made. With the valued co-operation of the Royal Society, there should therefore be no excuse for the neglect or oversight of, or failure to develop, any invention which will help our seamen in their stupendous task of beating the enemy.—*Army and Navy Gazette*, 7/31.

THE U. S. INVENTION AND DEVELOPMENT BUREAU.—America has not been long in following the lead of the British Admiralty in setting up what they term a "Bureau of Invention and Development," and, like their lordships at Whitehall, they have placed one of their most distinguished men at its head. Lord Fisher has been chosen in this country, and that world-famed inventor, Mr. Edison, in America, to preside over departments from which both countries may reasonably expect a great deal. We have, in this country, consistently neglected to encourage inventors, or even to give them reasonable facilities to work out their processes and protect their interests when their inventions have been placed on the market. America has done more for her brainy sons with ideas of improvements, and has, consequently, gained more from the genius of her citizens; but American statesmen evidently do not think the limit of encouragement and protection has yet been reached, and of all her sons no one is more competent to give the guidance and assistance required than Mr. Edison, who has been the cleverest inventor America or any other country has produced in the field of applied electrical science, not forgetting that eminent Italian, Marconi himself. To harness new and profitable ideas to the work of the state in this age of galloping progress, is a necessity to any nation which resolves to keep itself in the front rank and on the top line of industrial and military efficiency; and in no department of the state is investigation and encouragement more necessary than in the Department of the Navy.—*United Service Gazette*, 7/29.

AMERICA AND INVENTIONS.—The new department will consist of an Advisory Board of civilian inventors and engineers. Machinery will be

created by which it will be possible for naval officers and civilians to act conjointly, and to mobilize for the benefit of the navy the best engineering genius which exists in the American nation. Speaking generally, the Admiralty at Washington proposes to take the country into its confidence for the purpose of investigating new ideas and adopting them if they are practical. According to the New York correspondent of *The Daily Telegraph*, Mr. Edison considers the plan of the utmost importance. He looks especially to young men for inventions, upon the feasibility of which an expert board of mature experience will pass judgment. Mr. Edison claims that hundreds of ideas, a few of which are of supreme importance, are buried annually simply because inventors lack funds to exploit them, and so far have lacked departmental encouragement. The various bureaus of the American Navy are already overworked, and the necessity for a new bureau has become obvious as the war progresses and new lessons are taught. Mr. Daniels (Secretary of the Navy), writing to Mr. Edison to thank him for his patriotic acceptance of the offer to preside over the new board, has spoken of various new devices which the present war has shown to be necessary. Incidentally be has declared: "We are confronted with a new and terrible engine of warfare in the submarine, and I feel sure that, with the practical knowledge of the officers of the navy, with a department composed of the keenest and most inventive minds that we can gather together, and with your own wonderful brain to aid us, the United States will be able, as in the past, to meet the new danger with new devices that will assure peace to our country by their effectiveness."—*Naval and Military Record*, 7/21.

ADVISORY BOARD TO AID THE U. S. NAVY.—Mr. Daniels, Secretary of the Navy, announced to-day the names of the members of the Naval Advisory Board, composed of private inventors and scientists whom he gathered together in order to connect and co-ordinate the inventive genius of the country and the laboratory resources of private enterprise with the efforts of the navy in the development of naval inventions.

The first meeting of this board has been called for the morning of October 6 in the office of the Secretary of the Navy. Thomas A. Edison, as chairman of the board, will preside.

Commenting upon the work of the board, Mr. Daniels said to-day:

"Desiring to make available the latent inventive genius of our country to improve our navy, a short while ago I requested Mr. Thomas A. Edison to become chairman of an advisory board of eminent men who would make up the board. Mr. Edison, with the patriotism characteristic of American inventors, accepted the call to duty. The plan adopted for selecting the members of the Advisory Board was as follows:

"I requested 11 great engineering and scientific societies to select by popular election two members each to represent their society on the board. The result has been most gratifying. I have received the nomination of all these societies and have accepted them and it only remains to have a meeting, organize and determine the method of procedure in order to utilize to the best advantage of our navy this mobilization of the talent and genius of our great country.

"The reponses of the various societies invited to co-operate in the great undertaking indicate the patriotic enthusiasm awakened by this call to duty."

The Societies' Selections.—The following are the societies with the members selected and accepted, with a brief biography of each member:

American Aeronautical Society.—Hudson Maxim, Brooklyn, ordnance and explosive expert and maker of the first smokeless powder adopted by the United States Government, and Matthew Bacon Sellers, Baltimore, authority on aeronautics and the first to determine the dynamic air pressure on arched surfaces by means of "the wind funnel."

American Society of Automobile Engineers.—Howard E. Coffin, Detroit, Mich., and Andrew J. Riker, Bridgeport, Conn., inventors, automobile builders and now vice-presidents of large automobile manufacturing companies.

The Inventors' Guild.—Dr. Peter Cooper Hewitt, New York, inventor of appliances for telephones, hydroplanes, aeroplanes, balloons and electric lights, and Thomas Robbins, Stamford, Conn., inventor of many mechanical devices, including the belt conveyor for coal and ore, served in the New York Naval Reserve and observed military conditions at the front in France during the present war.

American Chemical Society.—Dr. W. R. Whitney, Schenectady, N. Y., creator and director of the research laboratory of the General Electric Company, and L. K. Baekelan, Yonkers, N. Y., a native of Belgium, famed particularly for the invention of a photographic paper.

American Institute of American Engineers.—Frank Julian Sprague, New York, an early assistant of Mr. Edison, who directed the building of the first successful electric trolley railways in the United States, Italy and Germany, and equipped the first electrically trained gun for the navy, and Benjamin G. Lamms, Pittsburg, inventor and head of a committee which passes upon all Westinghouse inventions.

American Mathematical Society.—Robert Simpson Woodward, president of the Carnegie Institute at Washington and an authority on astronomy, geography and mathematical physics, and Dr. Arthur Gordon Webster, Worcester, Mass., professor of physics at Clark University, inventor and the leading authority in America on sound.

American Society of Civil Engineers.—Andrew Murray Hunt, New York, graduate of the United States Naval Academy and experienced in development of hydro-electric steam and gas plants, and Alfred Craven, New York, son of an American rear admiral and now chief engineer of the New York Public Service Commission.

The American Institute of Mining Engineers.—William Lawrence Saunderson, New York, inventor and engineer, formerly newspaper and magazine editor and once Mayor of Plainfield, N. J., and Benjamin Bowditch Thayer, New York, metallurgist and explosive expert and now president of Anaconda Mining Company.

The American Electro-Chemical Society.—Dr. Joseph William Richards, South Bethlehem, Pa., professor of metallurgy and Lehigh University, and Lawrence Addicks, Chrome, N. J., metallurgical engineer and president of the American Electro-Chemical Society.

The American Society of Mechanical Engineers.—William Leroy Emmet, Schenectady, N. Y., engineer and inventor and first serious promoter of electric ship propulsion, having conducted the recent epoch-making series of experiments on the naval collier *Jupiter;* and Spencer Miller, South Orange, N. J., inventor of apparatus that has simplified coaling of ships, and of the breeches buoy device now used by the Coast Guard service in shipwreck rescue work.

The American Society of Aeronautic Engineers.—Henry Alexander Wise Wood, engineer and manufacturer, student of naval aeronautics and regarded by many as the world's foremost authority on the engineering features of the art of printing; and Elmer A. Sperry, electrical inventor and manufacturer.—*N. Y. Herald,* 9/13.

THE LABORATORY'S THE THING.—There is no question in our mind that Mr. Edison's suggestion of establishing a research laboratory in which inventions and discoveries of use to the navy may be developed—a suggestion eagerly accepted and promulgated by Secretary Daniels—is by far the most important feature of the proposed movement to mobilize American inventors in the interest of the American Navy. The same systematic inquiry and experimentation which is pursued by a large manufacturing corporation in order to improve its product and its processes should be

followed by the government in order to perfect its fighting material. An inquiry into the causes of bulb-blackening led to the evolution of the present high efficiency gas-filled tungsten lamp. Who knows what may not come of an inquiry, extending perhaps over years, into the causes of gun erosion?

Bearing in mind what the laboratories of the Geological Survey have done for the mining industry, what the Bureau of Standards has accomplished for manufacturers at large, what the Bureau of Chemistry of the Department of Agriculture is doing for farmers, it seems astonishing indeed that the navy and the army should not long ago have had their joint institution in which the most competent scientists are engaged in solving the problems which constantly arise in making rifles and screw propellers, range-finders and ammunition hoists more efficient. When we consider that in the last five years more improvements have been made in electric incandescent lighting than were made in the previous 20 years, thanks to industrial research conducted regardless of expense by a great electrical manufacturing company, when we consider what chemists employed by manufacturers have done in the creation of our magnificent cottonseed and corn products industries, what may not be expected of a government laboratory in which inventions and discoveries are to be developed for the benefit of the army and navy?

Once a laboratory is established along the lines, for example, of the Bureau of Standards, it may be seriously questioned whether we need an Inventors' Board of civilians. Government laboratories conduct splendid investigations of inks, building materials, soils, leathers and a host of substances without the supervision of manufacturers or farmers. If a lay supervising board is considered necessary, merely in order to insure a more sympathetic hearing to the civilian inventor, we doubt whether the board would justify its existence. While it is undeniable that both the army and the navy have been lax in encouraging the adoption of meritorious inventions—witness the list which we published last week—it is also undeniable that manufacturers are not much more progressive. The stories of inventors whose devices have been summarily rejected by the army and navy only to be adopted by foreign governments find their counterpart in the stories of inventors who have turned in vain from one manufacturer to another in order to obtain recognition. If Sir Hiram Maxim and the Wright brothers were at first refused due recognition, let it not be forgotten that Howe and Morse had to overcome almost insuperable obstacles, in the way of blindness and prejudice, before their sewing-machine and telegraph were successfully introduced. Army and navy officers are human beings like manufacturers, subject to the same failings, subject to the same conservatism. Once a research laboratory for the benefit of the army and navy is established, we may expect a change in the government's attitude toward the inventor. In other words, the mere existence of the laboratory would bring about with it a more liberal policy. The naval bureaus are now overworked. In the Bureau of Ordnance alone it is said 135 inventions a month have been submitted since the war started. How is it humanly possible for the officers in the bureau to pass anything but a snap judgment upon them. No doubt 90 per cent of them can be dismissed at once as obviously failing to fulfill the requirements of modern warfare. But what of the other 10 per cent? Who can spend weeks in studying a promising design from every angle? No wonder that a Harvey, a Janney or a Lewis is discouraged. It is the system which is at fault rather than army and navy officers themselves.

We have spoken of a "joint board" for the army and navy, and in closing we wish to emphasize the importance of making this movement apply from the very first to both branches of the service. So far as the principles are concerned, the objects of the proposed scientific investigation are the same, whether the subject of invention be designed for service in a fort, in the field, or upon a warship. If a Bureau of Inven-

tions is a good thing for the navy, so it is for the army. Should the bureau include both services, it will make for economy by reducing the plant and the staff and by avoiding much needless duplication of work.—*Scientific American*, 7/31.

TRIBUTE TO NAVAL INVENTORS

NEW YORK, July 28, 1915.

To the Editor of the Army and Navy Journal:

Will you kindly permit a civilian, who has had, since 1902, rather unusual opportunities to observe the naval service, to say a word regarding Secretary Daniels's progressive decision to create an inventions board?

That the genius of Edison, Wright, Ford and others should be mobilized in an advisory capacity for national defence is fortunate, but the naval personnel will be done an injustice if press and public are permitted to form the opinion that the navy has been or is sadly lacking in inventive skill. The contrary is true. While Mr. Edison and the others named cannot fail to aid naval science, they cannot give all their time, and the best results will be obtained by energizing the inventive genius already existing in the service, and affording opportunity hitherto partially denied for its *fullest* expression and accomplishment.

It is quite possible that the alternating of periods of duty ashore and afloat has promoted the practical quality of these accomplishments, but it is also true that the study, research and experimentation necessary for full development of valuable ideas originating in the service are retarded by lack of facilities, and often by assignment of the officer with the ideas to duty bearing little relation to the subject he is best qualified to master. For instance, an officer with a genius for ordnance will find opportunity during the period of his duty as gunnery officer of a battleship and a subsequent two years in the Bureau of Ordnance or in the naval gun factory or at the proving ground. But after that he is likely to be sent to sea as navigator of a battleship, a post in which he will have nothing to do with ordnance save at the risk of unwelcome intrusion into the domain of the gunnery officer, his junior.

Alternation of duty is necessary to make the personnel as a whole well rounded, efficient and experienced in all branches, but the service would vastly gain if the occasional bright particular genius could be devoted wholly to experimentation, both ashore and afloat, without adherence to the strictest rules of sea service now demanded for promotion. Success in invention is more a matter of application than inspiration, and herein the great mechanical skill of the personnel, both enlisted and commissioned, will find its fullest play if increased facilities and inducements for experimentation are provided within the service. It is to be hoped that the new policy will pay to the unheralded inventors now wearing the shoulder marks of Uncle Sam as much attention as to the civilian heroes of science whose names are household words.

ROBERT H. PATCHIN.

—*Army and Navy Journal*, 7/31.

INVENTIONS AND WAR.—Apart from Lord Fisher's appointment as its chairman, the creation of the Inventions Board "to assist the Admiralty in co-ordinating and encouraging scientific effort in its relation to the requirements of the naval service" is an event of some significance. It carries with it the implication that hitherto the Admiralty organization has not made adequate provision for the needs of the service in this respect. We trust, however, that the recent official announcement will not lead to the impression that hitherto no machinery of any kind has existed at the Admiralty for the investigation and testing of inventions. If this error of judgment be avoided, we believe that the new body is one to which a cordial reception may be accorded on national as well as naval grounds,

provided there is no intention on the part of the Admiralty to make it a shield against legitimate criticism of the Admiralty with respect to failure or delay in taking advantage of scientific developments. Divided authority spells weakness and confusion. In all matters affecting the equipment and employment of the navy the Admiralty must be supreme, and there must be no possibility of a plea being raised that any defects were traceable to faulty advice on the part of the Inventions Board or any other authority. Unity of control is the very essence of successful naval administration. When this principle is abandoned, dangerous rocks and shoals immediately appear.

The selection of Lord Fisher as chairman of the new body is an ideal appointment. This officer possesses an open mind. Throughout his long career he has always been deeply interested in things which were new, and anxious to see them tested with a view to ascertaining their real worth. His name is associated with a vast number of improvements in naval equipment. He rendered invaluable services as Director of Naval Ordnance and Torpedoes, and, later on, as Controller of the Navy, in spite of the many obstacles which in those days lay in the pathway of any officer who was not content to believe that all was for the best in the best of all possible navies, and that any departure from precedent was dangerous. Lord Fisher's influence on the material of the fleet did not become pronounced until, with the authority of First Sea Lord, he was able to exercise a considerable measure of freedom. He is popularly regarded as the creator of the all-big-gun type of battleship, but his outstanding claim to the gratitude of the nation lies in the prescience which he exhibited in adopting the water-tube boiler, the marine turbine, and oil in place of coal as fuel. By these successive innovations Lord Fisher conferred upon the fleet advantages, strategical and tactical, the value of which the present war has already indicated, although events at sea have not been marked by a naval battle on a grand scale. The battle cruiser was the inevitable sequel to the adoption of the water-tube boiler, the marine turbine, and oil fuel. Of the value of this particular type of ship there can be now no doubt. It was realized at an early stage by the Germans and even the American naval authorities, who regarded the new design with little favor, are now apparently convinced that ships of this type must in the immediate future be provided for the navy of the United States. Lord Fisher, though he has been associated with the navy for 61 years, is still an officer of marked progressive ideas, and for that reason his selection as chairman of the Inventions Board must be regarded as in every way admirable.

Never before did the British Navy need so urgently some authority to co-ordinate and encourage scientific effort in its relation to the naval service. We are confronted with the second greatest naval power, which is still undefeated. It would be folly to imagine that the Germans are permitting the months to succeed each other without making any effort to gain full advantage from whatever benefits time may enable them to bring to their assistance. It is the greatest folly to talk of the German fleet as being "in hiding," and to suggest that it is idle. The Germans are never idle. They have in particular a profound belief in scientific aid, and we may be sure that the best brains of the service are being devoted to improving the equipment of the High Sea fleet. We may dismiss the suggestion that the whole or any larger part of the main force of the enemy is being rearmed, but we do well to be prepared for surprises at sea not less disconcerting, if unforeseen, than those which have occurred on land. The German Naval Staff is dominated by men with progressive minds who are in close co-operation with the best scientists Germany possesses. We may be sure that nothing will be left undone to increase the striking power of the navy, and that every practicable device will be pressed into its service. The war has already revealed the resourcefulness of the enemy. We have learnt of mines being dropped overboard by retreating cruisers in the pathway of the pursuers, of submarines provided with

dummy funnels and sails (smoke issuing from the funnels), of the efforts of outpost ships to draw their opponents within range of powerful forces, and of advantage being taken of tide, current, and sun. Let the idea be banished that the German Navy is a force which we can afford to treat with contempt. It has remained more or less inactive during the past 11 months because inactivity has been regarded as the best policy. We shall commit an error if we conclude that the enemy has no further cards to play. He is resourceful, scientific, and "slim." We therefore welcome the decision to appoint an Inventions Board, "to assist the Admiralty in co-ordinating and encouraging scientific effort in its relation to the requirements of the naval service." But this is not enough. The best brains of the navy, and particularly the brains of its younger officers, who are most familiar with the possibilities of the future, ought to be devoted to the consideration of the various problems of naval warfare. No officer, however junior he may be, ought to be debarred from obtaining a prompt and careful consideration of any idea which occurs to him, and which he believes might be of service to the navy. The younger officers of the fleet, who belong to the new era and are unencumbered either by conservative instincts or the timidity and caution which is apt to come with advancing years, should be given every encouragement. If it is Lord Fisher's intention to take fuller advantage than has hitherto been the case of the inventive genius of the navy itself, while at the same time considering any and every suggestion which may come from outside sources, then the new Board of Inventions has before it a useful and valuable career.—*Navy and Military Record*, 7/14.

PROBLEMS FOR CONSIDERATION.—One plan put forward is for a squadron of one-gun submersible battleships to serve as auxiliaries to the main battle fleet, which is by no means new, and is nearer the mark than some of the proposals for a submersible battleship to supersede the present representatives of the class. Submersion is more and more coming to be regarded as an asset for defence, to be resorted to by a ship for her own safety, and the battleship is the one type of all others which ought not to want to seek protection in this manner. More to the point, it would seem, is the suggestion to limit the target presented to underwater attack at the expense of that shown above water. Before the submarine menace assumed its present proportions, it was a good thing to float warships as low in the water as possible and incidentally make them less conspicuous to an enemy, but the balance of advantage might seem now to rest in the other direction. If by an increase of the beam something can be done towards lessening the draft of the ship it will probably be found of value. Many other problems are ripe for consideration, such as the value of monitors, and whether these should form a permanent part of any complete battle fleet; the purpose of destroyers, and whether they are fitted for the numerous special duties war has thrust upon them; and the provision of anti-submarine boats. The last-named is an absorbing topic just now, and it is by no means impossible that just as the torpedo boat called forth the destroyer, so the submarine may bring into being a fast, light, ramming craft for its destruction.—*Army and Navy Gazette*, 7/24.

DANGER AND WEAKNESS OF LARGE SUBMARINES.—The sinking of the *Mariotte* in the Dardanelles brings to three the number of French underwater craft lost in the course of the war, the others being the 400-ton *Curie*, that came to grief in a brave but unsuccessful attempt at forcing an entrance into Pola Harbor, and the 390-ton *Saphir*, also sunk in the relatively shallow waters of the Dardanelles. The *Mariotte* was slightly larger, displacing 530 tons when steaming on the surface and 630 when totally submerged. With her six torpedo-tubes, her speed of 15 knots on the surface which unusually high bows enabled her to maintain in choppy waters, she represents apparently the heaviest loss of the kind yet suffered

by the service. The reality, however, is otherwise. She held the record for slow construction, having been designed in 1905 at the same time as the British boats of the *C* class, ordered in 1906, and launched in February, 1911, and afterwards waiting for months for her Diesel motors of 1440 horse-power that gave no end of trouble. She was in 1914 the longest under-water craft completed, her length of 65 meters exceeding that of the 800-ton *Archimède*, a feature which, together with the extraordinary shape of her hull, did not lead to handiness. Curious to note, similar reproaches applied to the *Saphir*, the other submarine victim of the Turks, which seems to justify the contention of Constructor Laubeuf that, for boats intended for duties in shallow waters or narrow seas, size and speed (which means length) are a source of danger and weakness, a displacement little superior to that of the English *C's* being sufficient for all defensive requirements.—*J. B. G., Naval and Military Record*, 8/11.

INVISIBLE PERISCOPE.—A method of making the periscope of a submarine invisible at sea to an enemy at any considerable distance away is, according to Reuter, to be tested on the *K 6*, which is now in dry dock in the Brooklyn navy yard. The periscope of this undersea craft has been painted in parallel stripes in various colors of the spectrum. It is calculated that these colors when refracted will be converted into a white ray, which will make it extremely difficult for an enemy to make out the periscope.—*The Engineer*, 8/20.

GUNS FOR SUBMARINES.—Several years ago naval experts in the United States recognized that it was imperative that submarines should be provided with armament in addition to torpedo-tubes, and the experiences of belligerents in the present war have strengthened them in that view. For nearly two years, it is reported, officials have been working out the problem of developing a weapon for the use of under-water craft when cruising on the surface which would not delay the clearing of decks for diving, and the conclusions arrived at as the result of investigations and experiments have now taken practical form. According to the *Army and Navy Register*, a 3-inch disappearing gun for under-water craft has been perfected by the Navy Ordnance Bureau, and, every test having resulted satisfactorily, the gun and carriage have been sent from the ordnance factory to New York for mounting on the new submarine *M 1*. The new gun is made shorter than the regular 3-inch navy weapon to meet space limitations. This reduces its range somewhat, but it has been fitted for very high angle fire, which will give it some chance for use against aeroplanes. The seagoing submarine authorized by the last Congress may be armed with two or more guns, possibly of 4-inch caliber, although final decision on this point has not been reached.—*Naval and Military Record*, 8/4.

GERMAN SUBMARINE BASES.—Unless they are much more numerous than we suppose, it is apparent that the *U* boats which operate off the Scilly Islands and at spheres even farther afield, contrive by some means or other to get maintenance stores, and thus obviate their going to and from Heligoland for supplies as often as would otherwise be the case. Large repairs may cause them to return to their base, but their activities at the Scillys and other distant spots prove that they draw supplies from places much nearer than Heligoland or Wilhelmshaven; for good as is their effective radius of action, most of their fuel supply, at least, would be required to travel to and fro and comparatively little could be used to maintain them on the areas where they commit their chief depredations.

Apart from the extemporized "mother ship," into which the ordinary merchantman of good tonnage can so easily be converted, the brain of man has likewise come to the help of submarines with an effective invention which may be, and probably is, standing them in good stead. It has been

known for some time past that Mr. Simon Lake, who is well known in America as a submarine expert of the first water, has invented a supply ship for under-water craft, which can be used under normal conditions to transfer stores and fuel to a submarine while she rests on the bottom of the sea, at a safe depth from attack. This fact is probably as well known to Germany as to the rest of the world, and as piracy is the stock-in-trade of German seamen, it is not at all improbable that they may have borrowed Mr. Lake's ideas and utilized them to some purpose for their own pressing needs at this juncture. They may even have purchased a "submarine freight train," as the invention is called, through the medium of an obliging neutral with pro-German proclivities. Several of these "trains" are known to be in existence, although no one appears to know what nations are in possession of them, but knowing the push and enterprise of the Germans in such matters it is not difficult to guess that Germany has at least examined their characteristics and probably tried their practicability.

These "freight trains," which may be doing such useful work for Germany at the present moment, are made up of two or more submersible cars, cigar-shaped, watertight and fitted with buoyancy tanks inside, with wheels on the lower side. These cars are towed behind a submarine, and must therefore reduce both its under-water and surface speed to a certain extent. Each car is built to carry fuel, oil and fresh water, and has a hose connection on the outside of the hull and there is also accommodation for amunition and food supplies in watertight cases. The towing submarine is able to re-victual, re-fuel, and re-munition itself by a very ingenious arrangement at its bow, which can be worked like a diving-bell and stores can be conveyed from the cars to the boat by careful manipulation of air pressures and pumps, which keep the inside dry even when the doors are open. The work is done by men in diving-suits and armor. The oil and water are transferred through pipes. There are no signs on the surface to "give away" the submarine while these transfers from car to boat are taking place. It can easily be seen that from arrangements of this sort a submarine can re-victual, re-fuel and re-store herself, and thus be her own "mother ship," and it may be that the German submarines owe their long distance activities largely to the aid of some such invention as that of Mr. Simon Lake.—*United Service Gazette, 7/22.*

SUBMARINES WEAPON OF WEAKER POWER.—Attention has been directed recently to the manner in which the successful exploits of the submarines have been almost entirely confined to waters in which the navies to which these under-water craft belong are in the weaker position. An examination of the achievements of the submarines certainly points to the fact that they are mainly the arm of the weaker power. After all, this is not to be wondered at, because is stands to reason that the weaker power, having to keep its larger vessels of war in port in the ordinary course of events, presents a smaller target to the torpedo attack of the enemy. The assault of the German submarines upon the mercantile marine of the British and Allied countries, and upon those of neutrals, is, as it were, a side issue, but even in that case, and if all the powers were to consider commerce raiding by submarines a fair and legitimate business, the conditions noted above would apply. The weaker powers are forced to withdraw their trade from those waters which are under the control of superior naval forces, and hence there are no merchant navies for the stronger powers to attack. The opportunities of the submarine commanders are in an inverse ratio to those of the commanding officers of surface vessels. The battleships, cruisers, and destroyers of the stronger fleet keep the seas clear of the enemy's squadrons, and thereby remove the objects of attack for the submarines. But the battleships, cruisers, and destroyers of the weaker fleet remain in port, whereas their submarines find plenty to do in watching and waiting for the enemy's

ships. It is a very interesting point, and one that will assuredly attract larger attention on the part of naval students when the war provides larger evidence for analysis and consideration. At the present time, it will be seen that in each theater of naval conflict, support is given to the theory which has been advanced. In the Baltic, for example, it is not the German submarines that have scored, but those of the British fleet which are working in conjunction with the Russian flotilla. Similarly, in the Adriatic, neither the French submarines nor, to any large extent, the Italian boats have succeeded in securing any victims. It is those of the weaker Austro-Hungarian fleet which have been able to sink a French and two Italian cruisers, and to injure a British vessel, though not seriously. In the operations around the Gallipoli Peninsula, too, the submarine *coups* have been mostly brought off by Germany. It was Hersing's boat which sunk the *Triumph* and *Majestic*, in spite of the fact that the naval forces of the Allies in the waters of the Ægean are in overwhelming strength. But, on the other hand, in the Sea of Marmora the ascendency is on the British side. In that sea, where the control is exercised, it may be assumed, by the Turco-German squadron, our submarines are exerting an influence in favor of the attack by the Franco-British forces. Even in the Black Sea, dominated by the Russian Navy, activity on the part of a German or Turkish submarine is reported, though this vessel has achieved no success, and, on the contrary, has been claimed unofficially to have been sunk. Finally, although the British fleet holds the virtual command in the North Sea, and around the shores of these islands, it has been unable to curb the efforts of the German submarines. Out of all these facts there arises the conclusion that the submarine has proved itself to be essentially the weapon of the weaker power. It would seem to follow that in future the smaller navies will certainly provide themselves with submarine flotillas for their protection. Such a conclusion may, of course, be considerably modified if, as is probable, a reply to the submarine is forthcoming.—*Army and Navy Gazette*, 7/24.

SEINING FOR SUBMARINES.—In *Leslie's Weekly* for August 26 Martin Marshall says: "A recent issue of the *Army and Navy Journal* made the assertion that Great Britain has destroyed 50 German submarines since February. This confirms the advices received from a prominent Briton who also had personal knowledge of the capture of three submarines in Scottish waters. Among the methods of capture the British Navy has resorted to seining with large, specially constructed nets drawn by steam trawlers. The first submarine taken in this way was brought to the surface and several British officers stepped on board to accept the surrender of the commander and crew. As soon as the commander, who emerged from the conning tower, saw that the deck of his boat was full of Englishmen, he shouted an order which resulted in the craft being blown up, carrying himself and his enemies to death. Since then submarines caught in nets are left on the bottom for ten days."—*Army and Navy Journal*, 9/11.

SUBMARINE HUNTING.—A correspondent who was permitted to visit the British fleet and the great naval base reports he was shown maps marking points where German submarines had been sighted and on which the results of the attacks were classified as "captured," "supposed sunk," and "sunk." When bubbles are observed rising for a long time at the same spot in smooth water it is taken for granted that a submarine's career has been ended. "How do you get them?" an officer was asked. "Sometimes by ramming, sometimes by gun-fire, sometimes by explosions, and in other ways we will not tell of," was the reply. All the officers aboard the battleships and armored cruisers are envious of those engaged in submarine hunts, which are regarded as great sport. The professional opinion was expressed that the reason the Germans were declared ready to forego submarine attacks on liners was the want of submarines and the personnel to

carry on their campaign. The admiral commanding at an important naval base told the correspondent that England had 2300 trawlers, mine sweepers and other auxiliaries in the work of blockading from the British Channel to Iceland and in keeping the North Sea clear, and that their reservist crews had been most zealous in combating the kind of naval warfare Germany wages. In a letter sent to the British press September 8, Alfred J. Balfour, First Lord of the British Admiralty, is reported as saying: "While the losses inflicted upon us by German submarines have been formidable, British mercantile tonnage is at this moment greater than when the war began. It is true that by this method of warfare many inoffensive persons —women and children as well as men, neutrals as well as belligerents—have been robbed and killed. But it is not only the innocent who have suffered; the criminals also have paid a heavy toll. Some have been rescued and are prisoners of war, but from the very nature of submarines it must often happen that they drag their crews with them to destruction, and those who send them forth on their unhonored mission wait for their return in vain. Herein lies the explanation of the amazing change which has come over the diplomatic attitude of Germany toward the United States."—*Army and Naval Journal*, 9/11.

SUBMARINE AGAINST SUBMARINE.—There have been two accounts of the sinking of one submarine by another. A dispatch from Berlin announces that a German submarine on July 26 sank the French submarine *Mariotte* in the Dardanelles Narrows. On a previous occasion an Austrian submarine sank the Italian submarine *Medusa*. Naturally these unofficial reports raise the question among naval authorities as to whether submarines can be used in defence against submarine attacks.—*Army and Navy Journal*, 7/31.

PLAN DOUBLE HULL AS TORPEDO GUARD.—A warship within a warship is likely to be the answer to the question of how to protect surface fighting craft from the attacks of submarines and mines, according to Commodore Murray F. Sueter of the British Navy, whose new book, "The Evolution of the Submarine Boat, Mine, and Torpedo,' is extensively reviewed and compared with other expert data by "A Naval Architect" in the *Journal of Commerce of Liverpool* of July 29.

After stating that nets have been found ineffective in warding off explosives from ships' sides and citing the case of the British battleship *Triumph*, recently sunk by a torpedo in the Dardanelles, with all her nets down, the reviewer says:

"Commodore Sueter remarks that it has long been contended that a cushion of water or compressed air is the best agent for minimizing an explosive effect. The adoption of this system would carry with it a greater system of cellular division, with increased rapid flooding arrangements and corresponding pump facilities, whereby it is thought that injuries might be minimized so as not to be too disastrous, as is usually the case from submarine explosion. To withstand the pressure involved in this, all compartments would be subjected to a severer test pressure during construction. A hydro-pneumatic protection would seem to be desirable, as it would produce a counteracting force inside the hull that will overcome, or at least minimize, the force caused by submarine explosive in contact with the outer skin, and so lessen the effect of the inward force. When a ship touches a mine, or a torpedo hits a ship, the center of the explosive effect is at the point of contact, and this effect radiates outward in all directions, but soon loses its power.

"With a hydro-pneumatic system of protection the explosive force would give up some of its energy at the outer shell and more energy would be taken up by the water plus the pressure of the air, and finally the remaining force would be spent against the inner hull. If this were made structurally stiff enough, and provided at intervals with relief hatches placed in watertight trunks in direct connection with the air, and

laid above the water-line so as to take off the unexpended gases caused by the explosion, much damage to the vitals might not occur. Commodore Sueter does not suggest that it would always be necessary to carry the water in the spaces between the two skins, but when in the vicinity of mines or torpedoes it would be done. In the usual way they would be empty, leaving a higher freeboard and a higher gun platform for fighting in open waters. Such a tank system would mean that the ship itself would be all contained in an inner skin, which would be from 10 to 15 feet from the outer skin. The air compressors could always be kept going in dangerous waters, and a sufficient pressure maintained in the tanks to be of greater service."

Water Ballast to Right the Ship.—"Numerous cases have arisen where vessels have capsized after being damaged on one side by a torpedo or mine explosion, and it does not seem difficult to provide large valves which can be immediately opened to the sea so that certain special compartments on the opposite side to the damaged one can be quickly flooded to compensate for the loss of buoyancy on the damaged side. This has actually been done in several vessels damaged before the present war started, but in these cases so far as is known no special arrangements were made. If, however, it has been shown possible to do it with the ordinary ship arrangements, it seems tolerably certain that the method would be effective when specially provided for. With the hydro-pneumatic system there is little or no danger from capsizing, as both sides of the vessel would contain water before damage, and after damage the distribution of water between the inner and outer skins would be practically unaltered."

The possibility of the use of heavy armor on the bottoms of warships as a torpedo guard is discussed at length, and among the opinions quoted is that of Professor William Hovgaard, the Danish naval expert, resident for several years in the United States, who stated at last summer's meeting of the British Institute of Naval Architects that armor was ill adapted to resist gaseous pressures, but was much better suited to resist local forces of great intensity, such as these due to the impact of projectiles.

"He went on to show," says the review, "that an explosion tends to expand its energy chiefly along the line of least resistance, a principle that is well illustrated in a gun. When a mine or torpedo explodes at the outer shell of a ship, if the side is unprotected it offers practically no resistance, and the explosive pressures will be relieved instantaneously by exhaust into the interior of the ship, where they may cause widespread destruction. If, on the other hand, it is possible to offer a greater resistance at the outer shell than that due to the inertia of the water, the explosive energy would be mainly expended upward into the atmosphere, since the line of least resistance would then be found in that direction, and Professor Hovgaard gave it as his conclusion that if armor is to be fitted at all it should be fitted on the outside, as plain surfaces were quite unsuited to withstand gaseous pressures, but he believed that elastic bulkheads offered a far better solution of the problem."

As a general proposition the armor plan was not regarded very favorably.

Wants Bulkheads 15 Feet From Side.—Attention to under-water protection was given by T. G. Owens-Thurston in a paper read before the naval architects three months previous to the summer meeting, and his suggestions are given as follows:

"He put forward two methods of protecting the side of a ship against submarine explosion, and as a result of experiments considered that protective bulkheads should be at least 15 feet from the ship's side. Mr. Owens-Thurston's first proposal consisted of the provision of the usual double skin forming an air space, with coal in two wing compartments, the inside bulkhead of the latter being vertical and formed of 1½-inch plating. In his second proposal the divisional bulkhead of the wing compartments is circular in shape and of thick steel. In the outer wing com-

partment a flexible flat steel wire rope screen, covered with sheet steel, is fitted, the inner bulkhead being as in the first arrangement."

In emphasizing the difficulties of the new defence problem the reviewer says:

"About eight years ago the French naval authorities carried out experiments by exploding guncotton charges against submarine armor plates, but the results were not by any means conclusive. It was thought that American corn pith cellulose, if placed behind a plate, would swell on contact with the water, and thus fill up the hole and stop the inrush of water. As a matter of fact, the experiments showed that the cellulose was simply blown away before it had time to get wet, and coal in a bunker would meet with the same fate as the cellulose.

"One important difference between the bursting of a high explosive shell from a naval gun and an explosion from a torpedo or mine lies in the greatly increased bursting charge of the two latter as compared with the former. A 14-inch naval gun can deliver a bursting charge of about 35 pounds inside a ship, whereas torpedoes and floating mines carry charges varying from 300 to 500 pounds. It is quite evident, therefore, that experience with explosive shells is not a reliable guide to the results produced by the explosion of the under-water weapons. There is a further difference in that a shell can pierce even the thickest armor in virtue of its great velocity, while a torpedo or mine explodes outside a vessel."

CHAIN NET SUBMARINE DEFENCE.—The exploits of British submarines which have passed through the mine fields of the Dardanelles Straits and have torpedoed ships in the Sea of Marmora, and even at Constantinople itself, prove that mine fields do not stop submarines. Heavy steel chain nets, however, do stop submarines, and the destruction or capture of over 40 submarines of the German Navy by the British during the past year of the war is due principally to this system of defence against the new mode of warfare. The Straits of Dover have been closed in this way from shore to shore, and the fact that for many months past not a vessel has been torpedoed in that stretch of the channel reaching from the Straits of Dover to a line drawn from Portland Bill, near Weymouth, to Cape de la Hague, France, suggests that here also, over a distance of some 60 miles, netting has been used so successfully as to prevent the entrance of the undersea craft.

Two hundred feet is about the practical limit of depth at which a submarine can navigate, and it would be entirely practicable to build and sink huge chain nets of this depth, supporting them from a line of buoys at the top and anchoring them both at the top and bottom edge, so that they would not be moved by the tide. We understand that openings, known only to the Admiralty, are provided in the nets which are capable of being swung open, pretty much as a section of a bridge of boats is swung around for the passage of merchant and other ships. The location of these openings is constantly changed, so that they cannot be known to the enemy. It is not necessary that the supporting buoys shall float at the surface. The anchorage cables may be so adjusted that the buoys float a few feet below the surface; and by this means absolute invisibility may be secured and the position of the nets rendered impossible of discovery by the enemy *U* boats, which, being completely blind when they are submerged, are liable to run into the nets, become entangled and so rendered subject to capture or complete disablement.

The port of New York, in which is located the most important naval dockyard of the country, presents ideal conditions for experimental work of this kind. It is only about half a mile across the Narrows, which connects the upper with the lower bay, and it is not much more than a mile, we believe, from Fort Schuyler to Fort Totten at the easterly entrance to New York harbor from the Sound.—*Scientific American*, 9/4.

IMPORTANCE OF HABITABILITY AND SEA-KEEPING CAPABILITIES FOR DESTROYERS.—The contretorpilleur *Bisson*, that has just distinguished herself, is in design a contemporary to the British *Beagles* and *Acorns* (1910-12), which she resembles in several respects and notably in her silhouette, copied from the British *River* class. She has a freeboard of no less than 14 feet forward, and her two 4-inch guns of 55 caliber, on raised platforms, possess remarkable elevation and command of fire. She was meant, together with her seven sisters, as an improvement on the earlier *Bouclier* and *Casques* of 660 tons, highly successful on paper and on trial, since they realized 35 and 36 knots for six hours, but which had the grave defect of developing leaks when going at full speed in even a moderate sea. This showed the importance of increasing the robustness of the hull and motors if the greater speed required was to exist otherwise than on paper, a lesson the British Admiralty has been the first to learn and to put in practice in her latest destroyers, that embody the data of a long experience and excel all rivals for sea qualities. With her Breguet turbines, that develop over 16,000 horse-power, and her smooth-working Guyot boilers, and the minor improvements which the additional 100 tons she has received permitted her to realize, the *Bisson* is considered, on the whole, to have come up to expectations. Yet in later boats it has been judged advisable to raise the displacement to 900 tons in the case of the *Gabolde*, *Roux*, and *Lestin*, and 1200 tons have been mentioned for the units ordered last year. Events, it must be said, have fully justified the Paris Admiralty in copying the British destroyer policy and in giving attention to robustness, sea-keeping capabilities, and habitability.—*Naval and Military Record*, 8/4.

ADVANTAGE OF LARGE AND SMALL DESTROYERS.—At the same time, the fact that the four units of the *Destroyer* class (*Spahi*, *Cognee*, *Fanfare*, and *Trident*), "cités a l'ordre du jour de l'armée navale," all belong to the 336-400-ton type, has called the attention of naval students to the merits of destroyers of moderate displacement similar to the early British 400-ton series, so much praised in their time and yet susceptible of rendering good service. Under modern conditions of warfare there are, it is remarked, many duties that require number, handiness, relative invisibility, and reduced vulnerability to submarine dangers rather than size and speed endurance. No doubt our 100-ton torpilleurs, though they have proved a thorn in the side of Channel pirates, are too fragile and too costly in upkeep to be really worth the expenditure they have entailed, and diminutive *poussière navale* of that kind has no longer any partisans. The British ex-coastal destroyers of 270 tons are much better, but yet do not meet the desiderata of experts. The demand is for the smallest displacement compatible with the robustness, sea speed, and radius of action needed for work with a dreadnought fleet, and this is about 400 tons, by unanimous consent. Admiralissimo de Lapeyrère is well known to be a strong supporter of these views, and when Minister of Marine he substituted for two 750-ton boats *en projet* two coal-burning contretorpilleurs of 407 tons, *Aspirant-Herbert* and *Enseigne-Henry*, to be the exact reproduction of the tried *Lansquenet* designs. The test of war has strengthened the case of those many officers who advocate a revision of the destroyer policy and the simultaneous laying down of large ocean-going boats of the English type and of small fleet torpilleurs.—*Naval and Military Record*, 8/11.

The contretorpilleur *Magon*, recently commended by the Italian naval authorities for her gunnery achievements against the Lagosta submarine station, deserves some attention, being the largest, and in some respects the most remarkable, of our destroyers at present in service. Her displacement is of 844 tons, her length of 83 meters, whilst her standard of robustness is superior to that of her smaller sister ships. She was designed by Constructor Laubeuf with a view to high sea speed, and to that end was given, in her aft portion, a shape similar to that of the latest British scouts. She

has proved a thoroughly reliable sea boat, and in order of value is claimed to come immediately after the larger and stronger British destroyers of the *L* and *M* series, having many points of advantage over the latest *Grosse Torpedobooten* of the Fatherland, as well as over her best rivals now in the Adriatic. A much-appreciated feature of the *Magon* and other large French contretorpilleurs consists in the command and arc of fire enjoyed by their 4-inch guns that are perched at a height of some 19 feet above the waterline, and can be used in most weathers. Experience has confirmed French naval men in the opinion that numerous destroyers of greater size and robustness than the *Magon*, and possessing unity of calibers similar to the English *Manlys*, form more than ever a primary need for a great fleet, and the foresight of the London Admiralty in achieving an easy supremacy in this important direction is much admired.—*Naval and Military Record*, 8/11.

IMPORTANCE OF HABITABILITY FOR BIG SHIPS.—Unfortunately, recent events, and especially the experience of the French fleet in the Mediterranean, where Admiral de Lapeyrère had to be in close proximity to hostile bases in readiness to meet an Austrian "sortie," have revealed the military value of the underestimated habitability factor. The 15,000-ton *Patries*, with their remarkably high freeboard and large square portholes and exceptional sea qualities, are spoken of with admiration by the officers who cruised many months in them in varying weather. The 18,000-ton *Dantons* proved also fine cruising homes, and rather more comfortable, strange to say, than the 23,457-ton *Courbets*, that have small, round port holes and the English system of side armor, with a relatively reduced number of openings, though the latter dreadnoughts embody many sanitary improvements over their predecessors. The extension of armor protection over the hull, necessitated by the long range and oblique hits of modern warfare and by the advent of aerial perils, will act, it is feared, detrimentally to the interests of habitability.

On the whole, and considering all classes of vessels, the British Navy is best off in this important respect, for the reason that it has never been the practice of the London Admiralty to sacrifice displacement and sea qualities to considerations of economy, English constructors always keeping in mind that the primary function of their fleet was to command the seas. British dreadnoughts, though offering not quite so high a target as the French, were last year described in the *Yacht* as being ahead of Gallic ships in what concerns sanitary arrangements. Of British battle cruisers, scouts, and destroyers it may truly be said that they are unequalled in the matter of habitability notably when compared with the low-freeboard *Moltkes* and the small cruisers and destroyers of the Fatherland. It is, for a great part, owing to this factor that the Anglo-French armada has been able to maintain, without any depreciation of its material and moral efficiency, the most extensive and longest blockade known in history.—*J. B. G., Naval and Military Record*, 8/4.

THE VALUE OF DESTROYERS.—In an article copyrighted by the Wheeler Syndicate, Inc., Prof. William Ledyard Cathcart, a graduate of the Naval Academy and an expert in matters connected with naval warfare, ascribes the practical immunity of the British battleship fleet in the North Sea from surface and underwater attack to the destroyers, which the General Board of our navy rank next to the battleships "for the general purposes of war on the sea." Led by the scout cruisers they have been the only means of maintaining close blockade of Germany's North Sea ports. "The radius of action and maneuvering qualities of these little vessels are remarkable. The *Benham* of the U. S. Navy, with 308 tons of fuel oil on board, can steam at her maximum speed for 980 sea miles, and at 12 knots an hour she has a theoretical radius of action of about 6000 miles. The turbine engines of many destroyers can be reversed from 'head' to

'astern,' or vice versa, in 15 seconds or less. This swift change at high speed and the shallow draft give these vessels that extreme mobility which makes them the terror of submarines."—*Army and Navy Journal*, 9/11.

REGRETTED DESTRUCTION OF TORPEDO CRAFT.—Last week we lost the destroyer *Lynx* by the explosion of a mine somewhere in the North Sea. This was one of the famous *K* class, and we could ill spare her, for we need every destroyer we possess, and as many more as our shipbuilders can produce, to keep the enemy submarines under water, where they are harmless. At every point our patrols require strengthening for this purpose, for it is particularly noticeable that where they are strongest the enemy's submarines are least successful in their attacks on our mercantile marine and warships. Speed is a great factor in the success of the destroyers employed on patrol duty and the *Lynx* was not only a 32-knot boat—more at her best—but was a fine upstanding and comfortable sea boat, even in such troubled waters as the North Sea. Her habitability qualities were of the kind that permitted her to continue her patrol in almost all kinds of weather (except the very worst) without wearing down her officers and men with the fatigue inflicted on the crews of smaller and slower craft of this type.—*United Service Gazette*, 8/19.

AN ARGUMENT FOR BATTLE CRUISERS.—According to the *Army and Navy Journal* "it would not be surprising if six battle cruisers were included in the naval program which the General Board will recommend to the Secretary early this fall."

Generally speaking, the policy of the board has been opposed to the construction of battle cruisers—this for the reason that the final issues of a naval war will be decided when the rival battleships meet and fight to a finish in a general engagement. The board has argued that only heavily armored battleships could "lie in line" with any hope of surviving an accurate gun-fire from the enemy. In this the board had behind it the practically unanimous opinion of the navy, including that of the naval constructors.

If the General Board should now recommend the building of battle cruisers, would this be a reversal of policy? Not by any means; for the board has been guided in its recommendations by the experience of actual warfare in the past, and the battle cruiser, until this war broke out, was largely an experiment. Congress, it well knew, would cut down such recommendations as were made, and it was the opinion of the board that these limited appropriations should be put into ships of the line, heavily gunned and heavily armored, rather than into swift and lightly armored battle cruisers. In recommending, if it should do so, the construction of battle cruisers, the board would be following out its policy of being guided by the actual experience of war, and it would be voicing the opinion of a rapidly growing majority among our naval officers.

It must certainly be admitted that in the actual fighting which has occurred on the high seas, the battle cruiser has more than redeemed the promises made for it by its sponsors. In the battle of Heligoland, early in the war, it was Admiral Beatty's battle cruisers which dashed in to the rescue of the hardly pressed British light cruisers and sank three of the light cruisers of the enemy. This they did in a sea which was infested with torpedoes, against which their high speed and quick turning power proved an efficient defence. Had Great Britain possessed no ships of this type, the German battle cruisers would have ravaged the undefended coast of Great Britain at will, or they could have broken through the cordon of blockading cruisers and created havoc among the merchant fleets of the Allies.

Admiral von Spee with the *Scharnhorst* and *Gneisenau* and the accompanying German light cruisers might have been roaming the seas even yet had not Great Britain possessed a fleet of battle cruisers, two of which, as

soon as they were dispatched to the theater of operations quickly found von Spee and sent his fleet to the bottom.

Thirty knots will be the standard speed for the battleship of the future; and if we fail to build any, how will our battleships, with an average speed of some nine or ten knots less, be able to protect our long coast line against an enemy possessing a fleet of these swift and powerfully gunned ships? The Spanish-American War is not so far removed in history but that many of us recall the frantic fear of some of our Atlantic coast cities, when it was learned that Cervera had set sail for our coasts. Members of Congress were besieged by importunate citizens who demanded that the fleet or a part of it, a battleship, a cruiser, or anything that could fight, be sent to guard them against attack. To-day, there would be a similar anxiety, intensified by the knowledge of the fact that our 21-knot battleship fleet would be powerless to annihilate, because it could never get within range of, a 30-knot battle cruiser fleet.

We had an instructive lesson in the need for ships of this type in the recent maneuvers off the Atlantic coast which followed the review at New York. The defending fleet had thrown out its scouts—such as they were—in the endeavor to get in touch with the approaching enemy; but these scouts were so slow and so limited in gun-fire that the moment they came in touch with the battle cruisers of which the invading fleet had several, they were either sunk or driven in upon the main fleet, to which the survivors returned with absolutely no information as to the composition or whereabouts of the enemy. As a matter of fact, throughout the whole of the maneuvers the defending fleet was completely "up in the air" as to the whereabouts, strength, and intentions of the invader. Had the defending force possessed powerful and swift battle cruisers, they could have broken through the enemy's scouting line, or at least have engaged it in equal battle, and in all probability the invaders would not have reached our coast without having to accept a line-of-battle engagement.

The program of the Navy General Board will be a liberal one, and we doubt not that, in view of existing conditions, Congress will be liberal with appropriations. It is our conviction that if the General Board send in a recommendation for battle cruisers only, so far as armored ships are concerned—four or six of them—they would be fully justified, not only by the events of the war, but also by the general conviction throughout the country. —*Scientific American*, 8/7.

INACTIVITY OF THE GERMAN NAVY.—Extracts from the letter of the First Lord of the Admiralty addressed to Mr. Tuohy, of the *New York World*:

July 31, 1915.

Dear Mr. Tuohy.—If anyone desires to know whether the British fleet has during the last year proved itself worthy of its traditions, there is a very simple method of arriving at the truth. There are seven, and only seven, functions which a fleet can perform:

It may drive the enemy's commerce off the sea.

It may protect its own commerce.

It may render the enemy's fleet impotent.

It may make the transfer of enemy troops across the sea impossible, whether for attack or defence.

It may transport its own troops where it will.

It may secure their supplies, and (in fitting circumstances) it may assist their operations.

All these functions have so far been successfully performed by the British fleet. No German merchant ship is to be found on the ocean. Allied commerce is more secure from attack, legitimate and illegitimate, than it was after Trafalgar. The German High Sea fleet has not as yet ventured beyond the security of its protected waters. No invasion has been attempted of these islands. British troops, in numbers unparal-

leled in history, have moved to and fro across the seas, and have been effectively supported on shore. The greatest of military powers has seen its colonies wrested from it one by one, and has not been able to land a man or a gun in their defence. Of a fleet which has done this we may not only say that it has done much, but that no fleet has ever done more. And we citizens of the British Empire can only hope that the second year of the war will show no falling off in its success, as it will assuredly show no relaxation of its efforts.

Pray believe me, yours faithfully,

ARTHUR JAMES BALFOUR.

—*United Service Gazette*, 8/5.

THE WORK OF THE FLEET.—It was fitting and proper that in the great speech he made at the meeting held at the London Opera House on the anniversary of the declaration of war, Mr. Balfour should place before our countrymen and Allies the work of the navy in its true perspective. He showed how in the past year it has meant all the difference between victory and defeat to the Allied cause. "Look at it as you will," he said, "all possibility of carrying on that war depended for its foundation upon the superiority at sea of the Allied fleets. The Allied fleets would not have been superior at sea had we in an unhappy moment of blindness and folly kept out of the contest, which we might have pretended to ourselves with some plausibility was not an immediate and pressing concern of ours. It would have been fatal in the long run to us, but it would have been fatal immediately and within a few months to those whom we are now proud to call our Allies." There has been an unfortunate tendency of late, while acknowledging the existence and value of the fleet, to dismiss its work lightly as a commonplace thing of no special interest. "I need say nothing about our fleet," said Mr. Asquith when the House of Commons adjourned; but why not? Surely he should have said everything about it. He could scarcely have exaggerated the vital and paramount importance of its achievement. Mr. Balfour drew a striking picture of what might have happened if the German fleet and not our own had ridden triumphant in the North Sea, the Atlantic, and the Mediterranean when war broke out and afterwards. It does not belittle the great and gallant work of our splendid troops to point out that with the Germans in control at sea the land campaign must have collapsed. Sir Robert Borden, who followed Mr. Balfour, showed how the Oversea Dominions realize that "the pathways of the seas are the veins and arteries of this Empire through which its life blood must flow. If these are once stopped or interfered with in any way the Empire cannot continue to exist." This metaphor, equally with that of the First Lord, gives expression to a fundamental truth which the Allied peoples should not be allowed for a moment to overlook.—*Army and Navy Gazette*, 8/7.

"OUR TRAFALGAR AND ITS SEQUEL."—Under this title an article appears in the new issue of *The Fortnightly Review*. The thesis is of interest. The writer, Mr. Archibald Hurd, contends that the British mobilization in the early days of last August, rapid and complete, was the first decisive move in the contest; no gun was fired and no casualties sustained, but the enemy suffered defeat, and was compelled by the overwhelming and well-organized and highly trained force arrayed against him to retire into his defended ports; and there he has remained, sheltering his ships behind his shore fortifications and minefields. "The mobilization of the British Navy was in the nature of an attack. Its success was so unqualified that there has been no attempt at a counter-attack. The victory achieved on August 3 constituted our Trafalgar, the benefits of which we have been enjoying for a full year." Under war conditions, it is contended, we have, in fact, never in the whole course of our history enjoyed such complete freedom in the use of the seas as has been ours since last summer, nor has there ever been

an occasion when sea power was so profitable, as the success of the war loans and the profits of the shipping interest and the comparative prosperity of the nation attest. It is even suggested by the writer that the victory which was achieved in the early days of last August was more complete than the battle of Trafalgar, and he produces evidence to show that German submarines have, in fact, done less injury to British commerce than was sustained owing to frigates during the years which followed upon the battle of Trafalgar.—*Naval and Military Record*, 8/4.

THE TEACHINGS OF ADMIRAL MAHAN VINDICATED.—Naval officers and men need be under no illusions as to the opinion held by neutral observers of the work which the British fleet has accomplished. Curiously enough the great papers of the United States have been more outspoken in their tributes than some of the papers published in this country. Take the case of the *New York World*. Had Admiral Mahan lived to see the beginning of the second year of the world-war it is stated he would have found in the events of the first year the most striking vindication yet recorded of the influence of sea power upon history. "Except for the British Navy, Germany to-day would be master of the world. Germany's marvellous preparedness, combined with her unparalleled military resources, gave the Teutonic alliance a commanding advantage that all the rest of Europe could not have withstood had land warfare been able to determine the result. But for British domination of the seas the war would be over and civilization prostrate before triumphal German militarism. What has been accomplished by British sea power has been carried through without a single conspicuous achievement. There has been no decisive naval battle. There has been no engagement between warships of the first class. Not a single dreadnought has yet been in action, except against land defences, or has sighted a hostile flag at sea. None the less, the work of the British Navy as a whole is the one decisive factor of the war." This tribute is merely quoted as illustrative of the tone of articles which have recently appeared in leading papers of the United States. The *New York Herald* has put the matter in a nut-shell by pointing out that "somewhere in the North Sea the grand fleet of Admiral Jellicoe keeps its ceaseless watch, content with the knowledge that each day is a new disaster for the beleaguered enemy and another victory for the Allies."—*Naval and Military Record*, 8/25.

THE NAVY "FATHER AND MOTHER" TO THE ARMY.—If the navy unsupported by military force had to admit failure when in March last an attempt was made to force the Dardanelles, it is now apparent that without the co-operation of the fleet the expeditionary force not only could not have obtained a footing in the Gallipoli Peninsula, but would have found it extremely difficult to maintain its position once the landing had been effected. That is the conclusion which must inevitably be drawn from General Sir Ian Hamilton's long, detailed, and graphic despatch describing the invasion of the Gallipoli Peninsula in face of stubborn resistance on the part of the Turks, firmly established in a terrain admirably adapted by Nature for the purposes of defence and with a wonderful defensive organization. It may be, as has been suggested in some quarters, that the transport arrangements fell short of perfection in some respects, but generally it must be admitted that never before did the naval and military forces of any country co-operate more cordially and with more complete harmony. The general commanding, while he pays to the troops employed a high tribute for their valor and doggedness, does not fail to put on record his gratitude to the fleet. "The Royal Navy," he declares, "has been father and mother to the Army." Sir Ian Hamilton is a military leader who has been distinguished by the singularly accurate view which he has always taken of the British defence problem. He has consistently preached the absolute necessity for unchallengeable naval strength as the foundation of our military power. He has now given to the world convincing evidence

of the accuracy of his own opinions. The navy not only carried the expeditionary force on its back, but without its aid that force might have been unable to hold its own even after the landings had been successfully carried out, with, unfortunately, heavy loss. In the history of amphibious warfare we have had no more remarkable illustration of the interdependence of British naval and military force than these operations provide.—*Naval and Military Record*, 7/14.

THE COST OF THE FLEET COMPARATIVELY SMALL AS A WAR ITEM.—The publication of the annual accounts of shipbuilding and dockyard transactions reminds us alike of the vast sum of national capital which is locked up in the fleet, and of the high cost of individual fighting units. As to the latter point the figures which are supplied, shrowing the aggregate expenditure on some of the latest ships of the fleet to be completed in the period covered by the report, are of interest:

BATTLESHIPS

Iron Duke (completed March, 1914)	£1,899,915
Ajax (completed October 10, 1913)	1,796,945
Audacious (completed October 15, 1913)	1,816,815
Thunderer (completed June 12, 1912)	1,746,000

BATTLE CRUISERS

Lion (completed May 31, 1913)	£1,970,615
Queen Mary (completed August 30, 1913)	1,959,797
Tiger (up to March 31, 1914, unfinished)	1,462,457

LIGHT CRUISERS

Amphion (completed March 26, 1913)	£263,858
Arethusa (unfinished)	220,303
Birmingham (completed January, 1914)	321,909

The report of the comptroller and auditor-general shows that more money was spent on several of the vessels named during the following year (1914-15); the total expenditure on the *Iron Duke* was brought up to £1,944,803, and that on the *Queen Mary* to £1,961,000. The report shows that the total cost of the combatant ships on the strength of the navy was, at the date of the report, a year ago, no less than £174,166,488. Under peace conditions, this figure would have been advertised as an illustration of the profligacy of our expenditure upon armaments, to-day it is studied in relation to our aggregate expenditure upon the war, and it is revealed as a comparatively small sum, particularly if it be borne in mind how vast are the benefits which the nation is obtaining from its "bloated naval armaments."—*Naval and Military Record*, 7/21.

INLAND NAVAL ARSENALS.—One of the results of the lessons of the war has been to reconcile Frenchmen with the inland position selected for the Bizerta arsenal, which is some 60 kilometers from the coast, and had, for this reason, been the object of strong criticisms. Admiral Gervais had been ridiculed for having proclaimed that the first quality of a naval base consisted in being safe against a bombardment from the high sea, and he has received scant thanks for having given the Tunisian *point d'appui* some of the advantages possessed by British *ports militaires*, and notably by Rosyth. The fine gunnery achievements at some 20,000 meters by the *Queen Elizabeth*, witnessed by Frenchmen in the Dardanelles, have demonstrated that bases will have more and more to fear from distant bombardments, a danger against which submarines and mines only offer an inadequate protection, as the Austrians have to a certain extent experienced in Cattaro. It is, of course, realized that but for the command of the sea, so completely asserted by the English armada, Cherbourg might have paid the full penalty for offering, at easy ranges, such an ideal target to German gunners. It is curious to note that in the matter of ports the two extremes

are to be found under the Tricolor, viz., no base so vulnerable as Cherbourg, and, on the other hand, none so safely situated as is the Sidi-Abdallah arsenal.—*Naval and Military Record*, 8/25.

BRITISH TRADE INCREASE.—The trade figures throw a strange light upon the German blockade. During the first year of war, England's imports were actually larger than the year before, and progressively so. In August last year British imports were only £42,000,000; last July they were £75,000,000. The increases were chiefly in food, those of meat having doubled, and all others being larger. Yet starvation of England was the aim of the war zone decree. That is the test of whether the British or the German Navy is fulfilling its purpose better.—*New York Times*, 8/11.

USEFULNESS OF ZEPPELINS.—The Italian naval authorities, through their official organ, have compiled the following tables (reprinted here from *Aeronautics*) relating, first, to the loss of craft—excluding, of course, the two airships recently destroyed by British aviators—since the beginning of the war, and their successful raids.

ZEPPELINS LOST

Date.	Place.
1. August 6, 1914.	Liège.
2. August 6, 1914.	Between Hemexin and Antwerp.
3. August 20, 1914.	Badonviller.
4. August 20, 1914.	Grandviller.*
5. September, 1914.	Luxemburg.*
6. September 6, 1914.	Serodz.
7. October 14, 1914.	Warsaw†
8. January 25, 1915.	Libau.
9. February 18, 1915.	Isle of Faroe.‡
10. February 18, 1915.	Isle of Faroe.

* These two entries probably refer to the same occurrence.
† In all probability this airship was a Parseval, or belonged to the *M* type.
‡ The last two dirigibles were naval Zeppelins of the latest type, both stranded on the Danish coast as the result of a sudden snow squall.

It may be added that, in default of more precise knowledge, the above table is obviously based on newspaper reports, and cannot, therefore, be accepted as reliable, although, in the early stages of the war, Italy probably had a better opportunity of obtaining accurate knowledge than any belligerent or even any other neutral. The only Zeppelin losses, apart from those in the last two months, which are amply substantiated, are those which occurred on August 20 at Badonviller and on February 18 off the coast of Denmark.

On the other hand, the same authoritative source states that, until the end of February, Zeppelins carried out the following attacks.

Date	Place	Bombs dropped	Results
1. August 24, 1914.	Antwerp.	6	12 killed.
2. September 24, 1914.	Ostend.	3	Material damage.
3. September 25, 1914.	Ghent.	6	1 killed.
4. September 28, 1914.	Warsaw.	3	3 soldiers struck.
5. September, 1914.	Bielostock.	3	11 children killed.
6. October 1, 1914.	Antwerp.	3	Material damage.
7. November 22, 1914.	Cuxhaven.§	—	———
8. December 9, 1914.	Warsaw.	18	40 killed, 50 wounded.
9. December 26, 1914.	Nancy.	14	2 killed, 2 wounded.

§ During the raid on Cuxhaven by our aeroplane squadron, two Zeppelins appeared and were soon put to flight by the fire of our ships.—*Scientific American*, 7/31.

THE BAN ON NAVAL BOOKS.—Regulation 18 of the Defence of the Realm Regulations "forbids the collecting, recording, publishing, or communicating of any information with respect to the description or condition of any of His Majesty's ships of such a nature as is calculated to be or might be, directly or indirectly, useful to the enemy, and likewise forbids any person to have in his possession without lawful authority or excuse any document containing any such information." In accordance with this regulation the Admiralty have placed a ban on the sale of any books "containing profile outlines, drawings, photographs, or silhouettes of His Majesty's ships." No doubt the Admiralty have good reason for this drastic action, though they do not say what they are—and quite rightly so. On the other hand, it is not intended to shut the public off from all information about the fleet. It is announced that "new editions of such books should omit all drawings, etc., respecting His Majesty's ships, and, subject to this condition, may be sold as usual." We have never before in modern times been engaged in a great war, and it will be generally felt that the Admiralty are wise in exercising every possible precaution in order that the ends of the enemy may not be served.—*Naval and Military Record*, 8/25.

SHIPS *versus* COAST FORTS, BY "MARSYAS."—The experiences of Liège and Antwerp have shown that guns in forts are no longer safe behind armor, and that therefore coast defence guns should be dispersed and concealed, not concentrated in forts. Heavy howitzers of 12 inches and over are far more useful than guns. It is better to spend money on ordnance than on armor; light shrapnel-proof and splinter-proof shields are all that is necessary. The fire of ships against concealed guns on shore is not likely to be effective, and the best method is to land troops to take the forts in rear.—*Journal Royal Artillery*, June.

ENGLAND'S MUNITION PROBLEM DUE TO PEACE-TIME FOLLIES.—Everything in this country is done by fits and starts. We suffer from an epidemic of particular ideas, which take possession of the majority of the people to the exclusion for the time of all other ideas. On the eve of the war a widespread campaign was being conducted against the cost involved in the maintenance of the navy and the army. Those who supplied the needs of the two services were described as war-traders, and held up to public condemnation. When at last war had been declared, the majority of the nation rushed to the conclusion that the great thing was to enlist every man of military age in the new armies. The result was that, by every form of personal and popular pressure, men were forced to enlist, irrespective of the sphere in which they might most usefully promote the national cause. In these circumstances tens of thousands of skilled workmen joined the new armies. At last realization came of the character of the war being waged on the Continent, and a cry was raised for more munitions. Instantly those who a few months before had denounced navy and army alike, and had then led an intemperate and inconsiderate movement in favor of recruiting, swung round and expressed amazement and contempt because our supply of munitions of all kinds was not superior to that possessed by the enemy. Those who will take the trouble to review the course of events—political, military, and industrial—during the past 12 months will realize the full extent of the follies which have been committed under the influence of an uninstructed public opinion, led in the main by ignorant politicians. We had mortgaged our wealth in the promotion of a series of social reforms, we had discouraged the firms concerned in the making of armaments and munitions, we had distracted the services by drawing them within the political arena—and now, after a year of warfare, surprise is expressed because we are not as well armed as the Germans who have devoted 40 years to the preparations for this war.—*Naval and Military Record*, 7/14.

THE NEED FOR SPECIALIZING.—Another lesson taught by this war is the necessity for special training for each separate branch of the service. Formerly an army was comprehensively styled "horse, foot and artillery," with more or less organized transport, commissariat, and medical services. The navy was manned by sailormen (seamen gunners) and marines. Today there are many branches of service in both the navy and army, each requiring so much scientific, technical, and mechanical skill and experience that men must "specialize" almost from the day they enlist. With the progress of invention, the demarcation between these branches becomes every year more sharply defined, and a higher standard of proficiency and dexterity is demanded.

An entirely new branch, the flying corps, has proved to be of inestimable value in scouting. In a short time it will be found the most terribly offensive weapon of war; squadrons of aeroplanes, numbering many thousands, will be used to destroy ships, cities, and arsenals with greater immunity from loss than could be obtained by any force operating on land or on board a ship. The fate of nations may in future be decided in the air. For this service very special training is required. The airman is a man apart, and his value as a fighting unit is increasing every day.

In the navy, a similar subdivision of service is now established. The same class of men may be found in battleships, cruisers, destroyers, submarines, and hydroplanes, but although the titles which distinguish duties or rank may be the same, the work required in each type of ship is so different that special knowledge is essential to every man. The days of the "captain" and "sailing master" with the same men to work and fight the ships under them are gone. It is an illustration of the subdivision of labor in the industries of production applied to the industry of defence or destruction, and with similar increase of efficiency, because each man knows his own work and knows it thoroughly. In every ship will now be found artillerists, torpedo specialists, electricians, and engineers, all trained for, and with special knowledge of, a particular duty.

When men are drafted into submarines, they have to be specially trained for their duties; and as the intricacy and complexity of these peculiar craft increase with their size and power, so must the skill, knowledge, and dexterity of the crew develop in proportion.

To one branch of naval service the executive has persistently refused full recognition of its place and value on board ship. The engineer was long regarded by the deck officer as a kind of glorified mechanic, a tradesman, a "smoke admiral," or "king of grease," as one well-known admiral called him. The engineer, knowing his value, refused to accept the assumption of the executive officer that he was inferior in brains, education, or responsibility, and rebelled against the inferior status assigned to him. In the opinion of the Admiralty it was impossible to admit men to commissioned rank who had not been trained specially for the navy practically from childhood. In no other way, it was alleged, could it be assured that they were gentlemen, and fit to associate with executive officers. In support of this contention the Selborne-Fisher scheme was devised. Under it all youngsters entering the navy are put through the same course of preliminary training, and afterwards are allowed to select the deck or engine-room as their future sphere. The executive officers, no doubt, get a thoroughly efficient training, the engineers do not; they have a smattering of theory and only a modicum of practice.

Under the new conditions the real work of the engine-room will be done by the artificers who are thoroughly trained mechanics, or were, for they also resent the subordinate position assigned to them, and, on account of the difficulty of getting fully qualified men, stokers and greasers are being promoted to artificer rank. Over all the engine- and boiler-room staff will be the imperfectly trained, and comparatively inexperienced, lieutenant (E). The scheme has not worked satisfactorily, and will have to be amended. No better proof of this can be adduced than the fact that at the

beginning of this war it was found necessary to give to the old men still in the service who had passed direct from Keyham or the merchant navy into the Royal Navy the same status and titles as had been enjoyed by their intended successors, the engineer lieutenants and captains of the naval engineering schools.

The Selborne-Fisher scheme is alluded to by way of contrasting the partly, with the properly, trained engineer. In the merchant navy there are no such hybrids. There the captain commands the ship and every man in it, but leaves engineering and the control of the engine- and boiler-rooms to his engineers with entire confidence, because he knows the whole of the staff to be thoroughly practical as well as scientific men. In the Royal Navy the captain must have a genteel hermaphrodite to come between the oily wind of the artificer and his nobility.

The specialization, the subdivision of knowledge, skill, and training required of the different units in order to produce an efficient whole has been amplified at some length, because recognition not merely of its advantages, but of its absolute necessity, is the base on which the scheme of military or naval training which I advocate is constructed. With the complete details of that scheme I trust you will allow me to deal in a second letter.

I am, yours truly,

PETER SWAN.

—*Engineering*, 8/13.

APHORISMS FOR NAVAL WARFARE.—Published in the May *Rivista Marittima* for the guidance of the Italian fleet.

1. Be ever daring, but never venture unless a chance shrewdly taken may gain an adequate reward.
2. Seize the occasion, but don't trust yourself to create it.
3. Welcome fortune's aid, but let sober wisdom be your guide.
4. In danger, be guided by common sense, not by faith in your lucky star.
5. Think keenly, act quickly.
6. God grants victory to the foresight and discipline that guards against defeat.
7. Precise orders are the best guarantees of proper execution.
8. Let orders be the fruit of mature reflection, that they may enlighten and guide those who should promptly and faithfully carry them out.
9. The mistakes of the enemy should give rise, not to illusions and false confidence, but to increased watchfulness and resolution.
10. Imagine always that the enemy knows your actions and intentions, and realize thus the greater need to conceal and protect them.
11. Assume the enemy capable of every wile and stratagem, and bent on employing them to your destruction.
12. From the beginning of a naval encounter, it should be directed steadily to the full attainment of its purpose.
13. A weaker fleet, with inferior speed, may sometimes find salvation in renewed attack, never in retreat.
14. Victory, however dearly bought, is less costly than the most economical defeat.
15. Far from being flattered by the fair success of an indecisive action, let it serve only to redouble your cunning, ardor and energy.
16. Self-confidence is ever the greatest factor of success.
17. An aggressive spirit redoubles the offensive strength.
18. Ship stopped or under slow headway in the open sea, ship in danger.
19. No precaution or vigilance too great for a ship at anchor.
20. (For the gunnery division). Load quickly, aim calmly, fire surely.
21. (For the watch). Keep a bright lookout, for in the vigilance of your guard lies the safety of all.
22. (For the engineer division). You keep the fires in the heart of the ship; keep cool as ice yourselves.

CURRENT NAVAL AND PROFESSIONAL PAPERS

NOTE.—Lack of space limits the scope of these references. Upon application, members of the Institute will be supplied with fuller references to current periodicals published in both the United States and foreign countries.

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1. SCIENTIFIC AMERICAN. **August 7.**—Telescope Sights for Fighting Rifles, by *Edward C. Crossman.* Searchlights and the Visibility of Distant Objects. Devices for Watching the Enemy from the Fighting Line. The Modern Automobile Torpedo, by *Edw. F. Chandler, M.E.* **August 14.**—High Explosives, their History, Manufacture, and Use, by *L. S. Marsh.* The International Ice Patrol and its Work. **August 21.**—Pontoon Bridges and Rafts. Increasing the Range of Our Coast Defence Guns. The Hot-air Engine, by *C. E. Duryea.* Hydraulic Turbines, by *H. J. Kennedy,* Strategic Moves of the War, by *Captain M. E. Hanna.* **August 28.**—The British Quick-Firing Field Guns. Submarine and Torpedoes, by *Lieutenant C. N. Hincamp.* **September 4.**—Manufacture of Aeroplanes in the United States, by *Fred. Eppelsheimer.* Effect of the War on American Industries (Part I). Giant German and Austrian Cranes (in Navy Yards). Radio-Telephony, by *W. C. White.* Military Explosives (Part I). Our Military Unpreparedness, by *Henry A. Wise Wood.* A Small Aero-Electric Plant, by *E. H. Williamson.* How War has Modified the Aeroplane, by *L. d'Orsey.* Submarine Nets (editorial). **September 11.**—Submarine Signaling.

2. JOURNAL AMERICAN SOCIETY OF NAVAL ENGINEERS. **August.**—Heat Losses in Steam Transmission, by *W. L. Cathcart.* Panama Colliers *Ulysses* and *Achilles,* by *H. B. Gregory.* Manganese-Bronze, by *Lieutenant J. B. Rhodes, U. S. N.* "Ericsson," by *W. H. A. Lange.* Inspection Notes, by *Captain F. W. Bartlett, U. S. N.* Method of Testing Safety Valves at the U. S. Naval Experiment Station, by *Ensign L. R. Ford, U.S.N.* Trials of Coast Guard Cutters *Ossipee* and *Tallapoosa,* by *Second Lieutenant of Engineers W. M. Prall.* Electric-Arc Welding, by *Lieutenant C. S. McDowell, U. S. N.* U. S. S. *Wadsworth,* by H. B. Gregory. Land Storage of Bituminous Coal; Spontaneous Combustion, by *Paymaster Geo. R. Crapo, U. S. N.* Notes: Iron a Factor in the World's Progress; Triple and Quadruple Screws; Modern Submarine Torpedo-Boats of the United States and other Navies; Geared Marine Steam Turbines; Cleaning of Condenser Tubes; The Purchase of Coal on Specifications; Good and Bad Lubricants; Successful Manufacture of Radium; Adapting a Submarine Transporter for General Cargo; Auxiliary Naval Vessels; Hall's System of Refrigeration for Ships; The Southwark-Harris Diesel Engine; A Mercury Vapor Engine; Cracked and Seized Pistons on Diesel Engines; Control and Protection of Electric Systems; First American Revolving Floating Crane; Reduction Gears on the *Pennsylvania.*

3. JOURNAL MILITARY SERVICE INSTITUTION. **September-October.**—Human Element in War (Reeve Memorial Prize Essay), by *General Carter.* The Responsibility for Unpreparedness, by *Lieutenant Colonel Hart.* On Military Libraries, by *Lieutenant Buttgenbach.* Translations: Six Months of War in Poland (L'Illustration, February, 1915); The Coming War (Published in Paris, May, 1911); American Notes (Jl. do Commercio, Rio Janeiro); Universal Service, Formerly and Now (Militär-Wochenblatt, 1914).

4. INFANTRY JOURNAL. **September-October.**—The Growth of War, by *Professor R. M. Johnston.* Army Training for Citizenship, by *Lieutenant Donald B. Sanger.* Evolution of the Infantry Company, by *Major L. L. Durfee.* An Available Reserve, by *Captain V. M. Elmore.* Compulsory Military Instruction at Schools, by *Colonel C. J. Crane.* Siege of Adrianople, by *Major S. C. Vestal.* Internment of Mexican Troops in 1914, by *Captain Geo. H. Estes.* Reprints and Translations: The Reorganization of the Cuban Army; Should Officers be Allowed to Resign? Army Recruiting Methods; Wanted: A Military and Naval Policy.

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7. THE OUTLOOK. **August 25.**—American Trade in Arms. The Situation in the Balkans: A Review. The Future of the Panama Canal: (I) The Canal in Time of War, by *George H. Blakeslee.* **September 1.**—The Russian Army, by *A Russian Conscript and George Kennan.* **September 22.**—Belgium under the Germans, by *Arno Dosch.*

8. NORTH AMERICAN REVIEW. **September.**—The Future of the Battleship, by *Rear Admiral Caspar F. Goodrich.* If America Enters the War, by *Lord Northcliffe.* How Should We Prepare, by *Charles W. Eliot.* The Freedom of the Seas, by *A. Maurice Low.*

9. ECONOMIC WORLD. **September.**—The Cost of the United States Navy, by *Assistant Secretary Franklin D. Roosevelt.*

10. YALE REVIEW. **October.**—Hatred—and a Possible Sequel, by *Professor L. P. Jacks, Oxford.* Italy and the War, by *Henry Dwight Sedgwick.* Compulsory Service in the United States, by *George Nestler Trioche* (formerly artillery officer, French Army). The Economic Aftermath, by *Alex. D. Noyes* (financial editor of *N. Y. Evening Post*). The War and International Socialism, by *Morris Hillquit.*

11. JOURNAL U. S. ARTILLERY. **July-August.**—Coast Artillery Target Practice: Its Purpose and How Best to Accomplish it, by *First Lieutenant Creedy C. Sheppard.* The Use of Our Seacoast Guns and Mortars in Land Defence, by *Second Lieutenant Meade Wildrick.* Spotting for R. F. Batteries: Training Spotters and a Description of a Range Correction Rule, by *Captain Hugh J. B. McElgin.* Range-Elevation Board for Mortars, by *Second Lieutenant Octave De Carre.*

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14. REVIEW OF REVIEWS. **September.**—The Vital Question of National Defence, by *Albert Shaw.* The Chino-Japanese Treaties, by *T. Iyenga.* Inventors and the Navy, by *Waldemar Kaempfert.*

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17. INTERNATIONAL MARINE ENGINEERING. **September.**—Modern Submarines in War and Peace (Part III), by *Simon Lake.* Selected Marine Patents (ill.).

18. JOURNAL OF ROYAL UNITED SERVICE INSTITUTION. **August.**—Some War Services of the Mercantile Marine, by *Commander W. F. Caborne, R. N. R.* The Laws of Naval War, by *G. Laghezza* (trans. from *Rivista Marittima,* by *P. Smiles*).

19. UNITED SERVICE MAGAZINE. **August.**—The Navy and the War, by *"Admiral."* War Notes, by *Captain H. M. Johnstone, R. E.* (Retired). Notes on Combined Naval and Military Operations, by *"G."* The First Year's War at Sea, by *Percival A. Hislam.* The Resurrection of Serbia, by *Lieutenant General F. H. Tyrrell.* Anglo-French Relations, by *Major General T. F. Lloyd.* Practical Rifle Shooting, by *Edward C. Crossman.* Has Recruiting in Ireland been Satisfactory, by *"Outis."* **September.**—A Naval Essay, 1914 (Contraband). The Struggle for Naval Predominance in the Adriatic, by *Commander Henry N. Shore, R. N.* Strategical Aspects of the Galician and Italian Campaigns of 1915, by *Major T. E. Compton.* The Strategic Situation in Poland, August, 1915, by *T. Miller Moguire.* Progress in Aeronautics, by *Major H. Bannerman-Phillips.*

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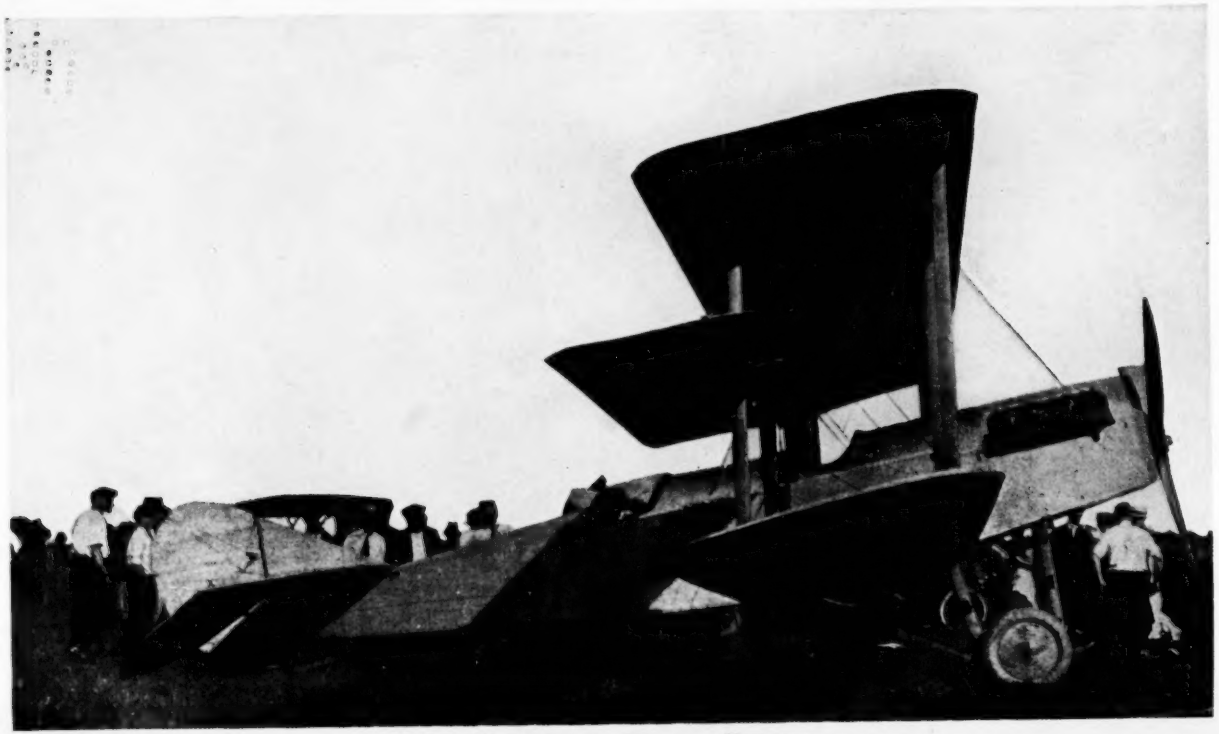

THE NEW CURTISS MILITARY BIPLANE

One of the two hundred ordered by the Allies, just after it had ascended 8300 feet at Buffalo with its operator, Raymond V. Morris, and three passengers, breaking the American height record for aeroplanes with passengers

EUROPEAN WAR NOTES

Compiled by LIEUTENANT C. C. GILL, U. S. Navy *

GENERAL ARRANGEMENT

PAGE

1. DIPLOMATIC NOTES 1703
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(Details of Land Operations are not included.)

[Events of international significance will be briefly chronicled in large type. Notes and comments bearing upon these events will be interspersed in smaller type. Addenda will be published in future issues to correct and complete this compilation.]

DIPLOMATIC NOTES

GREAT BRITAIN'S BLOCKADE OF GERMANY

On July 23 Great Britain despatched a note in general defence of her blockade methods employed against Germany. The note contends, (1) that since blockade is an allowable expedient of war, it is allowable to make it effective; (2) that extension of the blockade to German commerce through neutral ports, though an innovation, is essential to effective blockade; (3) that this extension can be justified, not only by the exigencies of the case, but by the example of the United States during the Civil War; (4) that it is consistent with the spirit and principles of the rules of war, and is enforced with due regard for legitimate commerce between neutrals. The text follows:

AMERICAN EMBASSY, LONDON, July 24, 1915.

Following note, dated July 23, received from Sir Edward Grey this morning:

"On the 2d of April your Excellency handed to me a copy of a communication containing the criticisms of the United States Government on the measures we have been constrained to take on account of the menace to peaceful commerce resulting from the German submarine policy. This communication has received the most careful consideration of his Majesty's government.

"2. I fully appreciate the friendly spirit and the candor which are shown in the communication, and, replying in the same spirit, I trust that I may be

* Acknowledgment is made to A. F. Westcott, Ph. D., Instructor U. S. Naval Academy, for help given in making this compilation.

able to convince your Excellency and also the Administration at Washington that the measures we have announced are not only reasonable and necessary in themselves, but constitute no more than an adaptation of the old principles of blockade to the peculiar circumstances with which we are confronted."

Must Take Every Step.—"3. I need scarcely dwell on the obligation incumbent upon the Allies to take every step in their power to overcome their common enemy in view of the shocking violation of the recognized rules and principles of civilized warfare of which he has been guilty during the present struggle. Your Excellency's attention has already been drawn to some of these proceedings in the memorandum which I handed to you on the 19th of February. Since that time Lord Bryce's report, based on evidence carefully sifted by legal experts, describing the atrocities committed in Belgium, the poisoning of wells in German Southwest Africa, the use of poisonous gases against the troops in Flanders and finally the sinking of the *Lusitania* without any opportunity to passengers and non-combatants to save their lives, has shown how indispensable it is that we should leave unused no justifiable method of defending ourselves.

"4. Your Excellency will remember that in my notes of the 13th and 15th of March I explained that the Allied governments intended to meet the German attempt to stop all supplies of every kind from leaving or entering British or French ports by themselves intercepting goods going to or from Germany. I read the communication from your Excellency's government not as questioning the necessity for our taking all the steps open to us to cripple the enemy's trade, but as directed solely to the question of the legitimacy of the particular measures adopted."

Question of Blockade.—"5. In the various notes which I have received from your Excellency the right of a belligerent to establish a blockade of the enemy ports is admitted, a right which has obviously no value save in so far as it gives power to a belligerent to cut off the sea borne exports and imports of the enemy. The contention which I understand the United States Government now puts forward is that if a belligerent is so circumstanced that his commerce can pass through adjacent neutral ports as easily as through ports in his own territory, his opponent has no right to interfere and must restrict his measures of blockade in such a manner as to leave such avenues of commerce still open to his adversary.

"This is a contention which his Majesty's government feel unable to accept and which seems to them unsustainable either in point of law or upon principles of international equity. They are unable to admit that a belligerent violates any fundamental principle of international law by applying a blockade in such a way as to cut out the enemy's commerce with foreign countries through neutral ports if the circumstances render such an application of the principles of blockade the only means of making it effective.

"The Government of the United States indeed intimates its readiness to take into account 'the great changes which have occurred in the conditions and means of naval warfare since the rules hitherto governing legal blockade were formulated' and recognizes that 'the form of close blockade with its cordon of ships in the immediate offing of the blockaded ports is no longer practicable in the face of an enemy possessing the means and opportunity to make an effective defence by the use of submarines, mines and aircraft.'"

Conforming to the Spirit.—"6. The only question then which can arise in regard to the measures resorted to for the purpose of carrying out a blockade upon these extended lines is whether, to use your Excellency's words, they 'conform to the spirit and principles of the essence of the rules of war'; and we shall be content to apply this test to the action which we have taken in so far as it has necessitated interference with neutral commerce.

"7. It may be noted in this connection that at the time of the Civil War the United States found themselves under the necessity of declaring a

blockade of some 3000 miles of coast line, a military operation for which the number of vessels available was at first very small. It was vital to the cause of the United States in that great struggle that they should be able to cut off the trade of the southern states. The Confederate armies were dependent on supplies from overseas, and those supplies could not be obtained without exporting the cotton wherewith to pay for them.

"To cut off this trade the United States could only rely upon a blockade. The difficulties confronting the Federal Government were in part due to the fact that neighboring neutral territory afforded convenient centers from which contraband could be introduced into the territory of their enemies and from which blockade running could be facilitated."

Old Doctrine Applied.—"Your Excellency will no doubt remember how, in order to meet this new difficulty, the old principles relating to contraband and blockade were developed and the doctrine of continuous voyage was applied and enforced, under which goods destined for the enemy territory were intercepted before they reached the neutral ports from which they were to be re-exported.

"8. The difficulties which imposed upon the United States the necessity of reshaping some of the old rules are somewhat akin to those with which the Allies are now faced in dealing with the trade of their enemy. Adjacent to Germany are various neutral countries which afford her convenient opportunities for carrying on her trade with foreign countries. Her own territories are covered by a network of railways and waterways, which enable her commerce to pass as conveniently through ports in such neutral countries as through her own. A blockade limited to enemy ports would leave open routes by which every kind of German commerce could pass almost as easily as through the ports in her own territory. Rotterdam is indeed the nearest outlet for some of the industrial districts of Germany.

"9. As a counterpoise to the freedom with which one belligerent may send his commerce across a neutral country without compromising its neutrality, the other belligerent may fairly claim to intercept such commerce before it has reached, or after it has left, the neutral state, provided of course that he can establish that the commerce with which he interferes is the commerce of his enemy and not commerce which is bona fide destined for or proceeding from the neutral state."

Extension is Defensible.—"It seems, accordingly, that if it be recognized that blockade is in certain cases the appropriate method of intercepting the trade of an enemy country, and if the blockade can only become effective by extending it to enemy commerce passing through neutral ports, such an extension is defensible and in accordance with principles which have met with general acceptance.

"10. To the contention that such action is not directly supported by written authority, it may be replied that it is the business of writers on international law to formulate existing rules rather than to offer suggestions for their adaptation to altered circumstances, and your Excellency will remember the unmeasured terms in which a group of prominent international lawyers of all nations condemned the doctrine which had been laid down by the Supreme Court of the United States in the case of the *Springbok*, a doctrine upheld by the claims committee at Washington in 1873.

"But the United States and the British governments took a broader view and looked below the surface at the underlying principles, and the government of this country, whose nationals were the sufferers by the extension and development of the old methods of blockade made by the United States during the Civil War, abstained from all protest against the decisions by which the ships and their cargoes were condemned.

"11. What is really important in the general interest is that adoptions of the old rules should not be made unless they are consistent with the general principles upon which an admitted belligerent right is based. It is also essential that all unnecessary injury to neutrals should be avoided.

With these conditions, it may be safely affirmed that the steps we are taking to intercept commodities on their way to and from Germany fully comply."

Playing the Game Fairly.—"We are interfering with no goods with which we should not be entitled to interfere by blockade if the geographical position and the conditions of Germany at present were such that her commerce passed through her own ports. We are taking the utmost possible care not to interfere with commerce genuinely destined for or proceeding from neutral countries. Furthermore, we have tempered the severity with which our measures might press upon neutrals by not applying the rule which was invariable in the old form of blockade, that ships and goods on their way to or from the blockaded are liable to condemnation.

"12. The communication made by the United States Embassy on the 2d of April describes as a novel and quite unprecedented feature of the blockade that it embraces many neutral ports and coasts and has the effect of barring access to them. It does not appear that our measures can be properly so described. If we are successful in the efforts we are making to distinguish between the commerce of neutral and enemy countries, there will be no substantial interference with the trade of neutral ports except in so far as they constitute ports of access to and exit from the enemy territory. There are at this moment many neutral ports which it would be mere affectation to regard as offering facilities only for the commerce of the neutral country in which they are situated, and the only commerce with which we propose to interfere is that of the enemy who seeks to make use of such ports for the purpose of transit to or from his own country.

"13 One of the earlier passages in your Excellency's memorandum was to the effect that the sovereignty of neutral nations in time of war suffers no diminution except in so far as the practice and consent of civilized nations has limited it 'by the recognition of certain now clearly determined rights' which it is considered may be exercised by nations at war; and these it defines as the right of capture and condemnation for unneutral service, for the carriage of contraband and for breach of blockade. I may, however, be permitted to point out that the practice of nations on each of the three subjects mentioned has not at any time been uniform or clearly determined, nor has the practice of any maritime nation always been consistent."

Methods have Varied.—"14. There are various particulars in which the exact method of carrying a blockade into effect has from time to time varied. The need of a public notification, the requisite standard of effectiveness, the locality of the blockading squadrons, the right of the individual ship to a preliminary warning that the blockade is in force and the penalty to be inflicted on a captured blockade runner are all subjects on which different views have prevailed in different countries and in which the practice of particular countries has been altered from time to time. The one principle which is fundamental and has obtained universal recognition is that by means of blockade a belligerent is entitled to cut off by effective means the sea borne commerce of his enemy.

"15. It is the same with contraband. The underlying principle is well established, but as to the details there has been a wide variety of views. As for unneutral service, the very term is of such recent introduction that many writers of repute on international law do not even mention it. It is impossible in the view of his Majesty's Government in these circumstances to maintain that the right of a belligerent to intercept the commerce of his enemy is limited in the way suggested in your Excellency's communication.

"16. There are certain subsidiary matters dealt with in your Excellency's communication to which I think it well to refer. Among these may be mentioned your citation of the declaration of Paris, due no doubt to the words which occur in the memorandum sent to me by your Excellency on the 1st of March, wherein it was stated that the allied governments would hold themselves free to detain and take into port ships carrying goods of presumed enemy destination, ownership or origin, and to our

announcement that vessels might be required to discharge goods of enemy ownership as well as those of enemy origin or destination."

Might do Worse.—"17. It is not necessary to discuss the extent to which the second rule of the Declaration of Paris is affected by these measures or whether it could be held to apply at all as between Great Britain and the United States. In actual practice, however, we are not detaining goods on the sole ground that they are the property of an enemy. The purpose of the measures we are taking is to intercept commerce on its way from and to the enemy country. There are many cases in which proof that the goods were enemy property would afford strong evidence that they were of enemy origin or enemy destination, and it is only in such cases that we are detaining them. Where proof of enemy ownership affords no evidence of such origin or destination we are not in practice detaining the goods.

"18. His Majesty's Government have been gratified to observe that the measures which they are enforcing have had no detrimental effect on the commerce of the United States. Figures of recent months show that the increased opportunities afforded by the war for American commerce have more than compensated for the loss of the German and Austrian markets."

Try to Make it Easy.—"19. I trust that in the light of the above explanations it will be realized that the measures to which we have resorted have been not only justified by the exigencies of the case, but can be defended as in accordance with general principles which have commended themselves to the governments of both countries. I am glad to be able to assure your Excellency that we shall continue to apply these measures with every desire to occasion the least possible amount of inconvenience to persons engaged in legitimate commerce.

E. GREY."

DECISIONS OF BRITISH PRIZE COURTS.—On July 14 the United States filed a caveat, reserving the right not to accept British prize court decisions governed by British municipal law in conflict with international law. The British reply of July 31 insisted that the principles and practice of American and British prize courts were similar, and that, while the British prize courts were bound to enforce the King's Orders in Council, these might be assumed to be in accord with international law. If the Orders should not be in such accord, an American citizen might make an appeal, through his government, to an international tribunal.

"NECHES" CASE.—On July 15 the United States protested against the detention and unlading of the American steamship *Neches*, bound from Rotterdam to the United States with a cargo of goods originating from Belgian territory in the hands of Germany. The note maintained "the right of the citizens of one neutral to trade with those of another, as well as with those of belligerents except in contraband or in violation of a legal blockade of an enemy seaport."

The British reply, dated July 31, referred to the general note of July 23, and called attention further to the alleged German practice of sinking neutral as well as British merchant vessels without regard to the destination of the vessel, the origin of the cargo, or the safety of passengers and crews.

BRITISH CRITICISM OF BRITISH POLICY.—"The Washington note makes a firm declaration that it takes its stand on the hitherto established principles governing neutral trade in war-time, and cannot recognize the modifications introduced by our Orders in Council, or the decisions of prize courts based upon them. The concrete case which it argues is that of the American ship *Neches*, carrying a general cargo from Rotterdam, which was arrested and made to discharge the cargo, the property of American citizens, on the ground that the goods came originally from a port of Belgium under the German occupation. There was here no question of

contraband, and Washington, when we speak of blockade, retorts with the hitherto accepted view that a blockade is of an enemy's ports and coasts.

"The argument of the British note is that a blockade of a country situated geographically as Germany is can be made effective only if we can also cut off her commerce through neutral ports. This is quite conclusive from the standpoint of our necessities, but it hardly meets the neutral case. The parallel with the application by the North in the Civil War of the doctrine of 'continuous voyage' to stop trade with the South by way of Mexican ports is good, we think, only when applied to trade in contraband goods. The Foreign Office is doing its best to defend the Admiralty's innovations in law, but it is fairly clear that a wrong way was adopted of achieving a proper end. It is better to stretch the doctrine of contraband than to blockade neutrals. We have absolute command of the seas, and materially we can do as we please, but we are bound in morals and in political prudence to try and do nothing which would justify neutral complaints against an abuse of our power. The protagonists of a war against militarism must guard themselves against complaints of 'navalism.'"—*London Nation.*

A formal declaration was issued by the British Foreign Office on **August 21**, designating cotton as absolute contraband of war. Accompanying the announcement a proposal was made to initiate measures to relieve the depression of the cotton market.

The following explanation of the British policy regarding cotton was made by Lord Robert Cecil, Under Secretary for Foreign Affairs:

"Cotton is a very important, an essential ingredient, in fact, of propulsion explosives. Copper is contraband by all the laws of the nations, and yet in the present war cotton has been shown to be more important than copper. There may be a substitute for copper in making munitions of war. For cotton there is no known substitute. If American cotton goes through to Germany the Germans use it to kill Allied soldiers. Therefore cotton must not go to Germany."

Legal to Make it Contraband.—"Making cotton contraband would be a distinctly legal action and can be internationally justified beyond protest. So far as American cotton is concerned, however, the problem of marketing cotton on this side would undergo little change. American cotton destined for Germany is now stopped. If the product were made contraband it would be stopped in the same manner. The principal difference would be that if cotton were contraband shipments from America which were suspected of being for Germany would be seized and would be liable to confiscation by prize court procedure if proof were obtainable of German destination, whereas now the cotton is seized but not necessarily confiscated.

"In any case, whether cotton is contraband or not, the Allies must permit neutral trading in this product. American growers must be given their market in neutral countries, even if they are adjacent to Germany, and the industries of those countries must have the cotton required for their own needs. How to permit this supply to move forward and yet safeguard the Allies' interests by making sure that none of it will go to the enemy constitutes a complicated problem of great dimensions.

"We are interested only in keeping cotton out of Germany. We not only do not object to its going to neutral countries, but we, in fact, are anxious that it should go in order that there shall be minimum inconveniences to the neutrals concerned.

"It is obvious what the loss of German and Austrian markets will mean to American cotton growers. We fully realize that if there is no German and Austrian outlet prices may go down and that Americans will suffer unless some means are devised for compensation. Proposals in that direction have been made and are receiving careful consideration. What will

come of them I cannot say at this time. Certainly I am not at liberty to imply that favorable action will be taken, nor will I say that it will not.—*N. Y. Herald*, 8/14.

In protest against the British order declaring cotton contraband, Senator Hoke Smith, of Georgia, makes the following points:

(1) Cotton is used in explosives only as a last resort, when cheaper materials cannot be obtained, and not as a common thing.

(2) At the conference of the nine great naval powers at London in 1908-1909, the representatives there assembled adopted the resolution that raw cotton should be free and under no circumstances to be declared contraband.

(3) The one exception to the rule that cotton should be on the free list was when Russia in 1905 declared cotton contraband.

Great Britain and the United States protested the legality of this order. Great Britain put her protest on the ground that British India was by far the largest exporter of raw cotton to Japan, and officially advised Russia as follows:

"The quantity of raw cotton that might be utilized for explosives would be infinitesimal in comparison with the bulk of the cotton exports from India to Japan for peaceful purposes, and to treat harmless cargoes of this latter description as unconditional contraband will be to subject a branch of innocent commerce to a most unwarranted interference."

Great Britain protected her citizens and Russia allowed their cotton shipments to go to Japan.—*N. Y. Sun*, 9/10.

MEAT CARGOES CONDEMNED.—The long-delayed decision of the British Prize Court in regard to various American cargoes, principally of meat, shipped, for the most part, by the great American packing companies, was delivered on September 16, the British court condemning the greater part of the American products. Leave to appeal was given. Comment on this decision will be found in our editorial columns. The action of the British Prize Court will not, it is understood, materially affect or modify the tenor of the forthcoming note to Great Britain, dealing with interference with American trade and the operation of the Order in Council. Secretary Lansing announced on September 17 that this note was finally completed and was ready for dispatch to Ambassador Page in London.

FINAL DECISION IN "DACIA" CASE.—The decision of the French prize court in the case of the American steamship *Dacia*, formerly owned by the Hamburg-American Line, which was seized by a French cruiser in February while bound with a cotton cargo for Bremen, has been made public. The decision covers 20 pages. It says the prize court finds no proof that the transfer of registry was not made to save the ship from risk of capture in accordance with the laws of war, but that, on the contrary, the ship under her new flag was making a voyage for which she had been loaded while still under an enemy flag. Therefore, the court finds the transfer "tainted with fraud and against the rights of belligerents" and orders the steamship seized as a prize. The American-owned cotton cargo of the *Dacia* has been partly paid for by the French Government through the French Ambassador at Washington. The *Dacia* has now been renamed *Yser*.—*Shipping Illustrated*, 8/21.

UNITED STATES AND GERMANY

In a note on the *Frye* case, dated **July 30**, Germany held to her previous contention that the destruction of the vessel did not constitute a violation of the Prussian-American Treaty of 1799. The note proposed further that the amount of the indemnity be settled

by two experts designated respectively by Germany and the United States, and that the interpretation of existing treaties be submitted to the Hague tribunal. To this the American State Department acceded in a note dated **August 13**, requesting information, however, as to what Germany's practice would be while the matter was under adjudication. The final German reply of **September 19** gave the promise that American vessels carrying conditional contraband would be permitted to continue their voyage if it were impossible to take them into port. With regard to vessels carrying absolute contraband, Germany reserved the right to destroy whenever permissible under the provisions of the Declaration of London. The text of the **September 19** note follows:

BERLIN, September 19, 1915.

With regard first to the ascertainment of the damage by experts, the German Government believes that it should dispense with the nomination of an umpire. In the cases of the ascertainment of damages hitherto arranged between the German Government and a neutral government from similar causes the experts named by the two parties have always reached an agreement as to the amount of the damage without difficulty; should it not be possible, however, to reach an agreement on some point it could probably be settled by diplomatic negotiations. Assuming that the American Government agrees to this, the German Government names as its expert Dr. Kepny, of Bremen, director of the North German Lloyds; it begs to await the designation of the American expert.

The German Government declares that it agrees to the proposal of the American Government to separate the question of indemnity from the question of the interpretation of the Prussian-American treaties of 1785, 1799 and 1828. It therefore again expressly states that in making payment it does not acknowledge the violations of the treaty as contended by the American side, but it will admit that the settlement of the question of indemnity does not prejudice the arrangement of the differences of opinion concerning the interpretation of the treaty rights and that this dispute is left to be decided by The Hague Tribunal of Arbitration.

The negotiations relative to the signing of the compromise provided by Article 52 of The Hague Arbitration Convention would best be conducted between the Foreign Office and the American Embassy at Berlin in view of the difficulties in the way of instructing the Imperial Ambassador at Washington. In case the American Government agrees the Foreign Office is prepared to submit to the embassy a draft of such a compromise.

The American Government's inquiry whether the German Government will govern its naval operations in accordance with the German or the American interpretation of the treaty stipulations in question, pending the arbitral proceedings, has been carefully considered by the German Government. From the standpoint of law and equity it is not prevented in its opinion from proceeding against American ships carrying contraband, according to its interpretation, until the question is settled by arbitration.

For the German Government does not need to depart from the application of generally recognized rules of the law of maritime war, as the Declaration of London, unless and in so far as an exception based on a treaty is established beyond all doubt. In the case of the present difference of opinion between the German and the American Government such an exception could not be taken to be established except on the ground of the arbitral award. Moreover, the disadvantages to Germany which would ensue from the American interpretation of the treaty stipulations would be

so much greater as to be out of proportion to those which the German interpretation would entail for the United States. For whereas the American interpretation would materially impede Germany in her conduct of warfare hardly any particular disadvantage to American citizens would result from the German interpretation, since they receive full reparation for any property damage sustained.

Nevertheless, the German Government, in order to furnish to the American Government evidence of its conciliatory attitude, has issued orders to the German naval forces not to destroy American merchantmen which have loaded conditional contraband even when the conditions of international law are present, but to permit them to continue their voyage unhindered if it is not possible to take them into port. On the other hand, it must reserve to itself the right to destroy vessels carrying absolute contraband wherever such destruction is permissible according to the provisions of the Declaration of London.

"LEELANAW" SUNK BY SUBMARINE.—The American steamship *Leelanaw*, commanded by Captain D. B. Delk and owned by the Harby Steamship Company of New York City, was sunk by a German submarine on July 25 off the northeast coast of Scotland. All the members of the crew reached Kirkwall in their boats. The *Leelanaw* was carrying a cargo of flax, which is contraband of war, from Archangel to Belfast. Although the first accounts of the vessel's destruction were meager, it was apparent that the submarine commander had observed the recognized rules of warfare and had given the crew ample time to leave the *Leelanaw*. Inasmuch as the United States has insisted that a ship may not be destroyed even when the capturing vessel cannot take her to port, the government at Washington is expected to demand reparation from Germany for the loss of the *Leelanaw*, as was done in the case of the *William P. Frye*. The *Leelanaw* was built in Newcastle in 1886 and registered 1377 tons.—*Nautical Gazette*, 8/5.

CAPTAIN'S STATEMENT

ABERDEEN (via LONDON), Wednesday.

"They could not have treated us more courteously than they did," was the verdict of Captain Eugene Delk and the crew of the American steamship *Leelanaw* when questioned last night regarding their encounter with a German submarine. They travelled about 60 miles on the deck of the submarine and became well acquainted with its crew, several of whom had been in America.

"There is no story in it," Captain Delk said. "We stopped when a shot was fired behind us and then we had to leave. Our ship was shelled, bombed and torpedoed, but it took an hour and a half to sink her. The Germans took us aboard the submarine, carried us about 60 miles and then gave us directions for getting to Kirkwall, which we reached safely in about 12 hours."

The crew, of whom there are 32 besides the captain, explained that the German commander apologized for the necessity of sinking the ship, but said it was forced upon him by the fact that the *Leelanaw* was carrying contraband, and he was not in the habit of throwing overboard contraband cargoes.—*N. Y. Sun*, 7/29.

CLAIM FOR INDEMNITY

WASHINGTON, July 30.

The Washington Government expects Germany to pay for the American steamer *Leelanaw*, sunk by a German submarine off the Orkney Islands last Sunday, and the State Department transmitted instructions to Ambassador Gerard yesterday for proper presentation of the claim. Officials here say the case is exactly similar to that of the American ship *William P.*

Frye, sunk in the South Atlantic by the German auxiliary cruiser *Prinz Eitel Friedrich* last February. The claim for indemnity in both cases rests upon the treaty of 1828 with Prussia, which, the State Department contends, specifically prohibits destruction of ships under such circumstances. —*Boston Transcript*, 7/30.

At 9.15 a. m., on **August 19,** the White Star liner *Arabic* was torpedoed by a German submarine off the south coast of Ireland. According to reports of officers and passengers, the submarine was not observed, but only the wake of the torpedo, which struck about 100 feet from the ship's stern. Of 423 persons on board, 32 were lost. All of the 26 American passengers were saved.

GERMAN STATEMENT OF AUGUST 25.—The following statement concerning the German Government's attitude in regard to the *Arabic* was given out by Count von Bernstorff yesterday in this city:

The German Ambassador received the following instructions from Berlin, which he communicated to the Department of State:

So far no official information available concerning the sinking of the *Arabic*.

The German Government trusts that the American Government will not take a definite stand at hearing only the reports of one side, which, in the opinion of the Imperial Government, cannot correspond with the facts, but that a chance will be given to Germany to be heard equally.

Although the Imperial Government does not doubt the good faith of the witnesses whose statements are reported by the newspapers in Europe, it should be borne in mind that these statements are naturally made under excitement which might easily produce wrong impressions.

If Americans should actually have lost their lives, this would naturally be contrary to our intentions. The German Government would deeply regret the fact, and begs to tender sincerest sympathies to the American Government.—*N. Y. Times*, 8/25.

FINAL GERMAN REPORT ON "ARABIC" DISASTER

BERLIN, Thursday, via LONDON, Friday, 2.36 a. m.

Germany's note to the United States bearing on the sinking of the White Star line steamship *Arabic* on August 19, which was communicated to the American Ambassador, Mr. James W. Gerard, for transmission to Washington, is in the form of a memorandum, under date of September 7, the text of which follows:

"On August 19 a German submarine stopped the English steamer *Dunsley* about 16 nautical miles south of Kinsale and was on the point of sinking the prize by gun-fire after the crew had left the vessel. At this moment the commander saw a large steamer making directly toward him. This steamer, as developed later, was the *Arabic*. She was recognized as an enemy vessel, as she did not fly any flag and bore no neutral markings.

"When she approached she altered her original course, but then again pointed directly toward the submarine. From this, the commander became convinced that the steamer had the intention of attacking and ramming him. In order to anticipate this attack he gave orders for the submarine to dive and fired a torpedo at the steamer. After firing, he convinced himself that the people on board were being rescued in 15 boats.

"According to his instructions, the commander was not allowed to attack the *Arabic* without warning and without saving the lives unless the ship attempted to escape or offered resistance. He was forced, however, to conclude from the attendant circumstances that the *Arabic* planned a violent attack on the submarine.

"This conclusion is all the more obvious, as he had been fired upon at a great distance in the Irish Sea on August 14—that is, a few days before—by a large passenger steamer, apparently belonging to the British Royal Mail Steam Packet Company, which he had neither attacked nor stopped.

"The German Government most deeply regrets that lives were lost through the action of the commander. It particularly expresses this regret to the Government of the United States on account of the death of American citizens.

"The German Government is unable, however, to acknowledge any obligation to grant indemnity in the matter, even if the commander should have been mistaken as to the aggressive intentions of the *Arabic*.

"If it should prove to be the case that it is impossible for the German and American governments to reach a harmonious opinion on this point the German Government would be prepared to submit the difference of opinion, as being a question of international law, to The Hague tribunal for arbitration, pursuant to Article 38 of The Hague convention for the pacific settlement of international disputes.

"In so doing, it assumes that, as a matter of course, the arbitral decision shall not be admitted to have the importance of a general decision on the permissibility or the converse under international law of German submarine warfare."—*N. Y. Herald*, 9/10.

At 8.30 p. m., **September 4,** the Allan liner *Hesperian* was sunk off the south coast of Ireland, about 80 miles west of Fastnet. Thirty-two of the passengers and crew were lost, but none of American citizenship.

AFFIDAVIT OF FOUR OFFICERS OF THE "HESPERIAN"

WASHINGTON, D. C., September 7.

An affidavit signed by four officers of the vessel, was cabled to the State Department to-day by Consul Frost at Queenstown. The affidavit was not given out in full but this paraphrase was issued:

The *Hesperian* left Liverpool at 7 p. m. on Friday, September 3, and by 8.30 p. m. on September 4 had reached latitude 50 north, longitude 10 west, about 80 miles southwest of Fastnet.

Dusk was closing in rapidly at the time specified when an explosion took place against the starboard bow No. 2 bulkhead, admitting water into compartments 1 and 2. The vessel sank about 10 feet within four hours.

The explosion occurred within about eight feet of the surface, throwing a mass of water and steel fragments on the deck. From the steel fragments preserved it is indubitable that the explosion was caused by a torpedo and not by a mine. The characteristic odor of high explosive was noticeable.

No warning of any kind was received by the *Hesperian*. The track of a torpedo approaching the vessel was not observed by any of the ship's officers. They thought that on account of a failing light it may not have been possible to have seen it. No submarine was sighted before or after the explosion.

A 6-inch gun mounted on the stern of the *Hesperian* was painted a service gray, and would not have been conspicuous even at a short distance, and the officers think it could not have been observed at all through a periscope.

On board the *Hesperian* were 40 Canadian soldiers, including officers, all either invalided or in attendance upon those invalided. These soldiers were all from various Canadian organizations, but were not organized or traveling as a unit.

No American citizens were among the passengers so far as known. One cabin steward, N. J. Dallas, was an American citizen.

Very slight panic or confusion existed, and the boats and lifesaving apparatus were in readiness and worked well.

Wireless signals, siren, and rockets brought a British warship on the scene by 9.30, and two other Admiralty vessels before 10.30, but the *Hesperian* was not under convoy, and had not spoken to an Admiralty ship prior to the torpedoing.—*N. Y. Times*, 9/7.

STATEMENT FROM BERLIN

AMSTERDAM, via LONDON, September 14.

The following semi-official statement has been issued in Berlin, according to despatches from that city:

It appears from the news available up to the present, taken in conjunction with facts known in official quarters, to be practically impossible that a German submarine can at all be made responsible for the sinking of the *Hesperian*.

This assumption is warranted, firstly, because, according to the war plans, no German submarine on September 4 was in the locality where the *Hesperian* was sunk; secondly, according to the descriptions at hand from an English source, the explosion was of such a kind and its effects were such that it must be inferred it was caused by a mine rather than by a torpedo.

This is supported by the fact that, from the descriptions at hand, the ship was hit close to the stem and the two foremost compartments were filled with water.—*N. Y. Sun*, 9/15.

BRITISH STATEMENT

LONDON, September 20.

"According to information in the press, a semi-official statement has been issued at Berlin that it was practically impossible that a German submarine could have sunk the *Hesperian*, since, according to the war plans, no German submarine was on September 4 in the locality where the *Hesperian* was sunk; also, because, according to a description from English sources, the explosion was of such a kind that it must be inferred that it was caused by a mine rather than a torpedo.

"Undoubted proof exists that a German submarine was actually in the locality where the *Hesperian* was attacked, and ships were sunk both to the north and south of this spot on September 4 and 5. The explosion was of the type caused by a torpedo. This is conclusively proved by a fair-sized fragment of a torpedo now in the possession of the Admiralty, which was picked up on board the ship before she sank."—*N. Y. Times*, 9/21.

On **September 2** Ambassador von Bernstorff informed Secretary Lansing that the German answer to the American *Lusitania* note would contain the following passage: "Liners will not be sunk by our submarines without warning and without safety of the lives of non-combatants, provided that the liners do not try to escape or offer resistance." The German note has since been delivered but not published in full. It is understood that Count von Bernstorff has been granted more ample powers to handle the matter by informal conversations, rather than by further exchange of notes.

COUNT VON BERNSTORFF'S NOTE

My Dear Secretary.—With reference to our conversation of this morning I inform you that my instructions concerning our answer to your last *Lusitania* note contain the following passage:

"Liners will not be sunk by our submarines without warning and without safety of the lives of non-combatants, provided that the liners do not try to escape or offer resistance."

Although I know you do not wish to discuss the *Lusitania* question till the *Arabic* incident has been definitely and satisfactorily settled, I desire to inform you of the above because this policy of my government was decided on before the *Arabic* incident occurred.

I have no objections to your making any use you may please of the above information. I remain, my dear Mr. Lansing, very sincerely yours,

J. BERNSTORFF.

In commenting on this statement Secretary Lansing said: "In view of the clearness of the foregoing statement, it seems needless to make any comment in regard to it other than to say that it appears to be a recognition of the fundamental principles for which we have contended."—*N. Y. Sun*, 9/2.

FURTHER NEGOTIATIONS THROUGH AMBASSADORS

BERLIN VIA LONDON, September 17.

Mr. James W. Gerard, the American Ambassador to Germany, to-day at noon called on Dr. Gottlieb von Jagow, the Foreign Minister, presumably in connection with the situation surrounding the sinking of the White Star line steamship *Arabic* by a German submarine and the opening of negotiations on the submarine problem. No definite information is obtainable, however, concerning the subjects dealt with.

Nothing can be learned here which goes to confirm the statement made in a Washington despatch that it was the intention to open conversations between the two countries on the submarine situation, but officials generally assume that the news is correct and express the belief that the difficulties between the United States and Germany would be on a better way toward settlement by such a method.

Differences in viewpoints which are only stiffened when laid down in formal notes, it is generally believed by the officials, can be more easily adjusted in informal conversations, and all the more so, they say, because the fundamental differences of policy have largely disappeared under the new instructions regarding attacks on passenger steamships.

The United States and Germany, it is declared, appear to be now in substantial agreement on the principle involved, and it is now largely a question of adjusting cases like the *Arabic* in conformity with that principle.

Germany, it is believed here, will be ready to consider testimony bearing on the point of how far the captain of the submarine was justified in his belief that the *Arabic* was bent on attacking the submarine, and that in conversations she will have the opportunity to satisfy the American Government that her policy and practice under present conditions will harmonize in the future.

The reports that President Wilson will make no formal reply to the government's communication concerning the sinking of the *Arabic*, but will confer confidentially with Count von Bernstorff, are acclaimed by the *Germania* as "a new indication of the good will of the American Government and its intent to come to an understanding with us."

Previous diplomatic interchanges, says the *Germania*, have been made in disadvantageous circumstances because protests to Berlin have been reported in advance in British despatches.

"We believe friendly mouth to mouth negotiations will serve the purpose desired by both sides far better than the earlier interchanges," this newspaper adds.

Commenting on the conflicting reports from Washington concerning the *Arabic* case and its reference to The Hague, the *National Zeitung* says it understands negotiations are in progress in Washington looking to a removal of all misunderstandings. These negotiations are confidential for the present, it says, but there is definite reason for the hope that they will lead to a favorable result.

The present situation seems to have resulted from the supposed conflict between Count von Bernstorff's declarations and the *Arabic* note, the *National Zeitung* continues. In reality they were two separate and distinct pronouncements, notwithstanding their seemingly close connection, inasmuch as Count von Bernstorff could not possibly have known that the *Arabic* intended to ram the submarine which sank her.—*N. Y. Herald*, 9/18.

UNITED STATES AND AUSTRIA

In a note dated **August 12,** Secretary Lansing replied to a previous Austrian protest against the shipment of munitions to belligerent nations. The reply justified the practice by pointing out: (1) That it would be unneutral for the United States to "sit in judgment on the progress of the war and to restrict its commercial intercourse with a belligerent whose naval successes prevented the neutral from trade with the enemy"; (2) during the Crimean, South African, and Balkan wars, both Germany and Austria traded in war supplies with belligerents; (3) restriction of munitions trade in war time would require all nations to maintain vast stores of arms, and would tempt a nation so prepared to "employ force in asserting its rights rather than appeal to reason and justice." The text of the note follows:

THE SECRETARY OF STATE TO AMBASSADOR PENFIELD

DEPARTMENT OF STATE, WASHINGTON, D. C., August 12, 1915.

Please present a note to the Royal Foreign Office in reply to its note of June 29 in the following sense:

The Government of the United States has given careful consideration to the statement of the Imperial and Royal Government in regard to the exportation of arms and ammunition from the United States to the countries at war with Austria-Hungary and Germany. The Government of the United States notes with satisfaction the recognition by the Imperial and Royal Government of the undoubted fact that its attitude with regard to the exportation of arms and ammunition from the United States is prompted by its intention to "maintain the strictest neutrality and to conform to the letter of the provisions of international treaties," but is surprised to find the Imperial and Royal Government implying that the observance of the strict principles of the law under the conditions which have developed in the present war is insufficient, and asserting that this Government should go beyond the long-recognized rules governing such traffic by neutrals and adopt measures to "maintain an attitude of strict parity with respect to both belligerent parties."

To this assertion of an obligation to change or modify the rules of international usage on account of special conditions, the Government of the United States cannot accede. The recognition of an obligation of this sort, unknown to the international practice of the past, would impose upon every neutral nation a duty to sit in judgment on the progress of a war

and to restrict its commercial intercourse with a belligerent whose naval successes prevented the neutral from trade with the enemy. The contention of the Imperial and Royal Government appears to be that the advantages gained to a belligerent by its superiority on the sea should be equalized by the neutral powers by the establishment of a system of non-intercourse with the victor. The Imperial and Royal Government confines its comments to arms and ammunition, but, if the principle for which it contends is sound, it should apply with equal force to all articles of contraband. A belligerent controlling the high seas might possess an ample supply of arms and ammunition, but be in want of food and clothing. On the novel principle that equalization is a neutral duty, neutral nations would be obligated to place an embargo on such articles because one of the belligerents could not obtain them through commercial intercourse.

But if this principle, so strongly urged by the Imperial and Royal Government, should be admitted to obtain by reason of the superiority of a belligerent at sea, ought it not to operate equally as to a belligerent superior on land? Applying this theory of equalization, a belligerent who lacks the necessary munitions to contend successfully on land ought to be permitted to purchase them from neutrals, while a belligerent with an abundance of war stores or with the power to produce them should be debarred from such traffic.

Manifestly the idea of strict neutrality now advanced by the Imperial and Royal Government, would involve a neutral nation in a mass of perplexities which would obscure the whole field of international obligation, produce economic confusion, and deprive all commerce and industry of legitimate fields of enterprise, already heavily burdened by the unavoidable restriction of war.

German Trade in Arms.—In this connection it is pertinent to direct the attention of the Imperial and Royal Government to the fact that Austria-Hungary and Germany, particularly the latter, have during the years preceding the present European War produced a great surplus of arms and ammunition which they sold throughout the world, and especially to belligerents. Never during that period did either of them suggest or apply the principle now advocated by the Imperial and Royal Government.

During the Boer War between Great Britain and the South African republics the patrol of the coasts of neighboring neutral colonies by British naval vessels prevented arms and ammunition reaching the Transvaal or the Orange Free State. The Allied republics were in a situation almost identical in that respect with that in which Austria-Hungary and Germany find themselves at the present time. Yet, in spite of the commercial isolation of one belligerent, Germany sold to Great Britain, the other belligerent, hundreds of thousands of kilos of explosives, gunpowder, cartridges, shot, and weapons; and it is known that Austria-Hungary also sold similar munitions to the same purchaser, though in smaller quantities. While, as compared with the present war, the quantities sold were small (a table of the sales is appended) the principle of neutrality involved was the same. If at that time Austria-Hungary and her present ally had refused to sell arms and ammunition to Great Britain on the ground that to do so would violate the spirit of strict neutrality, the Imperial and Royal Government might with greater consistency and greater force urge its present contention.

It might be further so pointed out that during the Crimean War large quantities of arms and military stores were furnished to Russia by Prussian manufacturers; that during the recent war between Turkey and Italy, as this Government is advised, arms and ammunition were furnished to the Ottoman Government by Germany; and that during the Balkan wars the belligerents were supplied with munitions by both Austria-Hungary and Germany. While these latter cases are not analogous, as is the case of the South African War, to the situation of Austria-Hungary and Germany in the present war they nevertheless clearly indicate the long-established practice of the two empires in the matter of trade in war supplies.

In view of the foregoing statements, this Government is reluctant to believe that the Imperial and Royal Government will ascribe to the United States a lack of impartial neutrality in continuing its legitimate trade in all kinds of supplies used to render the armed forces of a belligerent efficient, even though the circumstances of the present war prevent Austria-Hungary from obtaining such supplies from the markets of the United States, which have been and remain, so far as the action and policy of this Government are concerned, open to all belligerents alike.

American Safety Involved.—But, in addition to the question of principle, there is a practical and substantial reason why the Government of the United States has from the foundation of the republic to the present time advocated and practised unrestricted trade in arms and military supplies. It has never been the policy of this country to maintain in time of peace a large military establishment or stores of arms and ammunition sufficient to repel invasion by a well-equipped and powerful enemy. It has desired to remain at peace with all nations and to avoid any appearance of menacing such peace by the threat of its armies and navies. In consequence of this standing policy the United States would, in the event of attack by a foreign power, be at the outset of the war seriously, if not fatally, embarrassed by the lack of arms and ammunition and by the means to produce them in sufficient quantities to supply the requirements of national defence. The United States has always depended upon the right and power to purchase arms and ammunition from neutral nations in case of foreign attack. This right, which it claims for itself, it cannot deny to others.

A nation whose principle and policy it is to rely upon international obligations and international justice to preserve its political and territorial integrity might become the prey of an aggressive nation whose policy and practice it is to increase its military strength during times of peace with the design of conquest, unless the nation attacked can, after war had been declared, go into the markets of the world and purchase the means to defend itself against the aggressor.

The general adoption by the nations of the world of the theory that neutral powers ought to prohibit the sale of arms and ammunition to belligerents would compel every nation to have in readiness at all times sufficient munitions of war to meet any emergency which might arise, and to erect and maintain establishments for the manufacture of arms and ammunition sufficient to supply the needs of its military and naval forces throughout the progress of a war. Manifestly the application of this theory would result in every nation becoming an armed camp, ready to resist aggression and tempted to employ force in asserting its rights rather than appeal to reason and justice for the settlement of international disputes.

Means World Militarism.—Perceiving, as it does, that the adoption of the principle that it is the duty of a neutral to prohibit the sale of arms and ammunition to a belligerent during the progress of a war would inevitably give the advantage to the belligerent which had encouraged the manufacture of munitions in time of peace, and which had laid in vast stores of arms and ammunition in anticipation of war, the Government of the United States is convinced that the adoption of the theory would force militarism on the world and work against the universal peace which is the desire and purpose of all nations with one another.

The Government of the United States in the foregoing discussion of the practical reason why it has advocated and practised trade in munitions of war, wishes to be understood as speaking with no thought of expressing or implying any judgment with regard to the circumstances of the present war, but as merely putting very frankly the argument in this matter which has been conclusive in determining the policy of the United States.

While the practice of nations, so well illustrated by the practice of Austria-Hungary and Germany during the South African War, and the manifest evil which would result from a change of the practice, render

compliance with the suggestions of the Imperial and Royal Government out of the question, certain assertions appearing in the Austro-Hungarian statement as grounds for its contentions cannot be passed over without comment. These assertions are substantially as follows:

(1) That the exportation of arms and ammunition from the United States to belligerents contravenes the preamble of The Hague convention, No. 13 of 1907;

(2) That it is consistent with the refusal of this Government to allow delivery of supplies to vessels of war on the high seas;

(3) That "according to all authorities on international law, who concern themselves more properly with the question," exportation should be prevented "when this traffic assumes such a form or such dimensions that the neutrality of a nation becomes involved thereby."

Hague Requirements Clear.—As to the assertion that the exportation of arms and ammunition contravenes the preamble of The Hague convention, No. 13 of 1907, this Government presumes that reference is made to the last paragraph of the preamble, which is as follows:

"Seeing that in this category of ideas these rules should not in principle be altered in the course of the war by a neutral power except in a case where experience has shown the necessity for such change for the protection of the rights of that power."

Manifestly the only ground to change the rules laid down by the convention, one of which, it should be noted, explicitly declares that a neutral is not bound to prohibit the exportation of contraband of war, is the necessity of a neutral power to do so in order to protect its own rights. The right and duty to determine when this necessity exists rests with the neutral, not with a belligerent. It is discretionary, not mandatory. If a neutral power does not avail itself of the right, a belligerent is not privileged to complain, for in doing so it would be in the position of declaring to the neutral power what is necessary to protect that power's own rights. The Imperial and Royal Government cannot but perceive that a complaint of this nature would invite just rebuke.

With reference to the asserted inconsistency of the course adopted by this Government in relation to the exportation of arms and ammunition and that followed in not allowing supplies to be taken from its ports to ships-of-war on the high seas, it is only necessary to point out that the prohibition of supplies to ships-of-war rests upon the principle that a neutral power must not permit its territory to become a naval base for either belligerent. A warship may, under certain restrictions, obtain fuel and supplies in a neutral port once in three months. To permit merchant vessels acting as tenders to carry supplies more often than three months and in unlimited amount would defeat the purpose of the rule and might constitute the neutral territory a naval base. Furthermore, this Government is unaware that any Austro-Hungarian ship-of-war has sought to obtain supplies from a port in the United States, either directly or indirectly. The subject has, however, already been discussed with the Imperial German Government, to which the position of this Government was fully set forth December 24, 1914.

Quotes German Authority.—In view of the positive assertion in the statement of the Imperial and Royal Government as to the unanimity of the opinions of text writers as to the exportation of contraband being unneutral, this Government has caused a careful examination of the principal authorities on international law to be made. As a result of this examination it has come to the conclusion that the Imperial and Royal Government has been misled and has inadvertently made an erroneous assertion. Less than one-fifth of the authorities consulted advocate unreservedly the prohibition of the export of contraband. Several of those who constitute this minority admit that the practice of nations has been otherwise. It may not be inopportune to direct particular attention to the declaration of the German authority, Paul Einicke, who states that, at

the beginning of a war, belligerents have never remonstrated against the enactment of prohibitions on trade in contraband, but adds "that such prohibitions may be considered as violation of neutrality, or at least as unfriendly acts, if they are enacted during a war with the purpose to close unexpectedly the sources of supply to a party which heretofore had relied on them."

The Government of the United States deems it unnecessary to extend further at the present time a consideration of the statement of the Austro-Hungarian Government. The principles of international law, the practice of nations, the national safety of the United States and other nations without great military and naval establishments, the prevention of increased armies and navies, the adoption of peaceful methods for the adjustment of international differences, and, finally, neutrality itself are opposed to the prohibition by a neutral nation of the exportation of arms, ammunition or other munitions of war to belligerent powers during the progress of the war.

LANSING.

—*N. Y. Times*, 8/15.

On **September 10** the American Government requested the recall of the Austro-Hungarian Ambassador at Washington. Its action is explained in the following note:

Mr. Constantin Dumba, the Austro-Hungarian Ambassador at Washington, has admitted that he proposed to his government plans to instigate strikes in American manufacturing plants engaged in the production of munitions of war. The information reached this government through a copy of a letter of the ambassador to his government. The bearer was an American citizen, named Archibald, who was travelling under an American passport. The ambassador has admitted that he employed Archibald to bear official despatches from him to his government.

By reason of the admitted purpose and intent of Mr. Dumba to conspire to cripple legitimate industries of the people of the United States and to interrupt their legitimate trade, and by reason of the flagrant violation of diplomatic propriety in employing an American citizen, protected by an American passport, as a secret bearer of official despatches through the lines of the enemy of Austria-Hungary, the President directs me to inform your Excellency that Mr. Dumba is no longer acceptable to the Government of the United States as the Ambassador of His Imperial Majesty at Washington.

Believing that the Imperial and Royal Government will realize that the Government of the United States has no alternative but to request the recall of Mr. Dumba on account of his improper conduct, the Government of the United States expresses its deep regret that this course has become necessary, and assures the Imperial and Royal Government that it sincerely desires to continue the cordial and friendly relations which exist between the United States and Austria-Hungary.—*N. Y. Herald*, 9/10.

DR. DUMBA'S LETTER.—This issue was precipitated by the detection by English authorities of a letter to his government written by Dr. Dumba and entrusted to the care of James F. Archibald, who was travelling under the protection of an American passport. In this letter Dr. Dumba stated: "I am under the impression that we could, if not entirely prevent the production of war material in Bethlehem and in the Middle West, at any rate strongly disorganize it and hold it up for months, which, according to the statement of the German Military Attaché, is of great importance, and which amply outweighs the relatively small sacrifice of money." Mr. Archibald, meanwhile, has been forced to return to this country, and will, it is understood, be arrested by federal authorities when he reaches New York. To what extent the Military Attaché to the German Embassy, Capt.

von Papen, is involved in this plot to interrupt the American production of munitions of war is not generally known, but his sudden departure for the Yellowstone is taken to mean that his usefulness at Washington is at an end. —*N. Y. Nation*, 9/16.

THE BALKAN STATES

Early in **September** Bulgaria received from Turkey the rights of the Dedeaghatch Railway to the Ægean and a strip of territory along the left bank of the Maritza River. Servia, through the influence of the Entente powers, at the same time offered to Bulgaria the greater part of the territory demanded by the latter power in Macedonia. At the close of the week ending **September 18**, the Entente powers delivered to Bulgaria a request for a clear definition of her attitude at the earliest possible date. This was followed, **September 21**, by general mobilization of Bulgaria's military forces, including about 50,000 from the territory offered but not ceded by Servia. Greece, who is bound by treaty to assist Servia in the event of Bulgarian attack, has responded by calling the classes of 1892-1911 to the colors.

PARIS, September 20.

Despatches from Sofia announcing the mobilization there of troops made up of residents of Macedonia have caused another complication to be introduced in the Balkan situation, which already was tense, through the presentation by the Entente Allies of the joint note requiring Bulgaria to define her attitude.

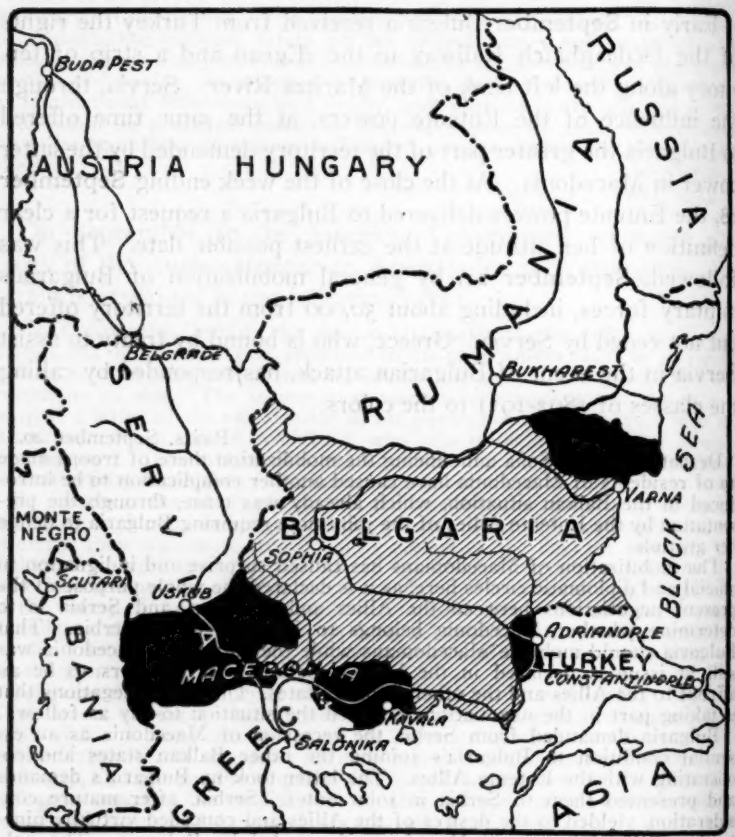
The mobilization of Macedonians has caused surprise and indignation in official and diplomatic circles here, as it is declared the whole purpose of the present negotiations between the Allies and Bulgaria, and Serbia is to determine whether Macedonia belongs to Bulgaria or to Serbia. That Bulgaria should mobilize Macedonians while the future of Macedonia was still at issue is declared in the highest Serbo-Greek quarters to be an affront to the Allies and the other Balkan States. One of the legations that is taking part in the negotiations outlined the situation to-day as follows:

Bulgaria demanded from Serbia the recession of Macedonia as an essential condition to Bulgaria's joining the other Balkan states and cooperating with the Entente Allies. The latter took up Bulgaria's demands and presented them to Serbia in joint notes. Serbia, after mature consideration, yielded to the desires of the Allies and conceded virtually nine-tenths of the territory in Macedonia demanded by Bulgaria. The only portion of Macedonia not conceded was a small section which was considered essential to Serbia's military defences, but these concessions of Macedonian territory were made in order that Bulgaria give something in return; namely, her co-operation with the Balkan states and the Allies. The Allies therefore handed Bulgaria a joint note last week reciting Serbia's concessions of nine-tenths of the disputed Macedonian territory, and in effect asking Bulgaria what she purposed doing as a result of the concessions.

Now, however, the diplomatic outline continued, before returning an answer Bulgaria assumes that she is master of Macedonia and begins the mobilization of Macedonian residents—that is, she assumes control of Macedonia before stating what she is willing to do for the Allies in return for such control. This, the diplomatic authority says, gives to the situation a new phase which may call for another note from the Allies in addition

to that of last week, asking an explanation of the Macedonian mobilization at the moment when the Allies are negotiating terms by which Bulgaria may obtain the recession of Macedonia.

It is understood the Allies' joint note of last week was accompanied by a verbal request to Mr. Radoslavoff, the Bulgarian Premier, for a reply "at the earliest possible date."



BULGARIA'S TERRITORIAL DEMANDS

The black portions of the map (which is based on one printed in the *New York Sun*) show the territorial concessions demanded by Bulgaria: namely, Adrianople and the surrounding territory, now Turkish; the Servian possessions south of Uskub; and the portion of Greece on the Ægean Sea including Kavala. Bulgaria would also like to regain the region north of Varna recently ceded to Rumania, also in black, but is not so insistent on this as she is regarding the other regions.

CHANGES IN GRECIAN MINISTRY.—On August 18 a new Grecian cabinet under former Premier Eleutheros Venizelos succeeded the Gounaris Ministry which resigned August 17 on the opening of Parliament. The policy of M. Venizelos is at present one of continued neutrality, opposed

to concessions to Bulgaria or other measures which would definitely commit Greece to one side or the other in the war. The Greek Parliament adjourned September 4, to re-assemble October 14.

ITALY

ITALY DECLARES WAR AGAINST TURKEY.—Italy declared war against Turkey on August 21. The Marquis di Garroni, the Italian Ambassador to Constantinople, presented his government's declaration of a state of war to the Turkish Foreign Office, demanded his passports, and immediately left the capital. Henry Morgenthau, American Ambassador, assumed charge of Italian interests.

The note presented by the Ambassador to the Turkish Government stated as the reason for the Italian action the support by Turkey of the revolt in Libya and the situation which has obtained in Ottoman territory for two months inimical to Italian subjects. This has particular reference to the prevention by Turkish authorities of Italians leaving Syria.—*N. Y. Evening Post*, 8/23.

NAVAL NOTES

Naval developments in the following strategic areas will be considered separately and in turn:

	PAGE
1. NORTH SEA	1728
2. BALTIC SEA	1730
3. ADRIATIC SEA	1734
4. BLACK SEA AND DARDANELLES	1735
5. FAR EAST, PACIFIC AND ATLANTIC	1757

BELLIGERENTS' WAR LOSSES

(On the left margin of this table of losses is a page reference to the Naval Institute War Notes.)

LOSSES OF BRITAIN AND HER ALLIES.

BRITISH WARSHIP LOSSES

PAGE	NAME	CLASS	TONNAGE	HOW LOST	DATE
245, 653, 1874	Audacious	dreadnought	25,000	By mine, Irish Coast	27-10-14
247	Bulwark	battleship	15,000	Internal explosion	26-11-14
644	Formidable	battleship	15,000	Torpedoed off Plymouth	1- 1-15
658	Irresistible	battleship	15,000	By mine, Dardanelles	18- 3-15
1374	Majestic	battleship	14,900	Torpedoed	27- 5-15
658	Ocean	battleship	12,950	By mine, Dardanelles	18- 3-15
1373	Goliath	battleship	12,950	Torpedoed	12- 5-15
1374	Triumph	battleship	11,800	Torpedoed	26- 5-15
271, 1886	Monmouth	armored cruiser	9,800	By gun fire, Coronel	1-11-14
271, 1886	Good Hope	armored cruiser	14,100	By gun fire, Coronel	1-11-14
1863	Aboukir	armored cruiser	12,000	By Submarine U-9	22- 9-14
1863	Hogue	armored cruiser	12,000	By Submarine U-9	22- 9-14
1863	Cressy	armored cruiser	12,000	By Submarine U-9	22- 9-14
1583	Warrior	protected cruiser	13,550	By mine	5- 9-14
249	Hermes	protected cruiser	5,600	Torpedoed by U-12	31-10-14
253, 1583	Pathfinder	light cruiser	3,000	By submarine U-21	5- 9-14
1583	Pegasus	light cruiser	2,135	By gun fire, Zanzibar	20- 9-14
1567	Amphion	scout cruiser	3,500	By mine	5- 8-14
1867	Hawke	unarmored cruiser	7,350	By submarine U-9	13-10-14
1364, 1004	Maori	destroyer	1,035	By mine, Belgium	7- 5-15
1728	Lynx	destroyer	935	Mined, North Sea	9- 8-15
1364, 1007	Recruit	destroyer	385	Torpedoed, North Sea	1- 5-15
1583	Speedy	gunboat	810	By mine, North Sea	3- 9-14
1366	No. 10	torpedoboat	215	Torpedoed	10- 6-15
1366	No. 12	torpedoboat	215	Torpedoed	10- 6-15
247, 1873	D-5	submarine	550	By mine	3-11-14
1871	E-3	submarine	725	By mine	18-10-14

PAGE	NAME	CLASS	TONNAGE	HOW LOST	DATE
1583	A-E-1	submarine	725	Foundered in Australia	14- 9-14
1018	E-15	submarine	725	Torpedoed to avoid capture	18- 4-15
	D-2	submarine	600	Missing	
	E-17	submarine	725	Missing	
	E-10	submarine	725	Missing	
1727	E-13	submarine	——	Stranded, Denmark	19- 8-15
1373	A-E-2	submarine	725	Sunk by enemy	30- 4-15
	Fishguard II	training ship	——	Foundered in North Sea	18- 9-14
250, 1873	Niger	torpedo gunboat	810	Sunk by submarine	11-11-14
1874	Oceanic	troop ship	18,000	Accidentally rammed	8- 9-14
1365	Princess Irene	auxiliary cruiser	5,934	Blown up, Sheerness	27- 5-15
	Clan McNaughton	armed merchantman	4,985	Wrecked	3- 2-15
	Rohilla	armed merchantman	7,400	By mine	30-10-14
649	Viknor	armed merchantman	5,386	Wrecked	14- 1-15
1005	Bayano	auxiliary cruiser	5,248	Torpedoed	11- 3-15
1728	India	auxiliary cruiser	7,900	Torpedoed, North Sea	8- 8-15
1755	Royal Edward	transport	11,117	By submarine, Aegean	14- 8-15
1729	Ramsey	patrol vessel	——	Sunk by Meteor	8- 8-15

FRENCH WARSHIP LOSSES

658	Bouvet	battleship	12,205	By mine, Dardanelles	18- 3-15
1012	Leon Gambetta	armored cruiser	12,000	By submarine, Taranto	27- 4-15
656	Dague	destroyer	720	By Austrian mine	24- 2-15
666	Mosquet	torpedoboat destroyer	298	Gun fire by Emden	28-10-14
	No. 347	torpedoboat	98	Sunk in collision	9-10-14
	No. 338	torpedoboat	97	Sunk in collision	9-10-14
647	No. 219	torpedoboat	87	Sunk off Nieuport	1-15
	Zelée	gunboat	680	By gun fire	28-10-14
260	Curie	submarine	398	Destroyed off Pola	12-14
655	Saphir	submarine	390	Wrecked	17- 1-15
1756	Mariotte	submarine	522	Sunk, Dardanelles	26- 7-15
1375, 1755	Casabianca	minelayer	495	Internal explosion	4- 6-15

RUSSIAN WARSHIP LOSSES

267, 666	Jemtchug	cruiser	3,050	Torpedoed by Emden	28-10-14
	Pallada	cruiser	7,775	By German submarine	11-10-14
	Putschino	torpedoboat		By gun fire	30-10-14
261	Prut	minelayer	5,500	By gun fire, Black Sea	29-10-14
	Donetz	gunboat	1,200	By gun fire, Odessa	29-10-14
1367	Yenissei	transport	——	Sunk by submarine	6- 6-15
	Kubanetz	gunboat	1,200	Sunk off Odessa	28-10-14
	Oleg	minelayer	1,125	Sunk Black Sea	24-12-14
	Athos	minelayer	1,743	Sunk Black Sea	24-12-14
	Riasan	transport	3,522	Captured by Emden	6-8-14
1732	Sivutch	gunboat	960	Gun fire, Gulf of Riga	16- 8-15

JAPANESE WARSHIP LOSSES

1878	Takachiho	old armored cruiser	3,700	By torpedo, Tsingtau	17-10-14
	Shirotaji	destroyer	380	Wrecked, Tsingtau	4- 9-14
	Name unknown	torpedoboat	——	By mine	
	33	torpedoboat	110	By mine, Tsingtau	11-11-14

ITALIAN WARSHIP LOSSES

1371	Amalfi	armored cruiser	9,958	Torpedoed	7- 7-15
1371	Giuseppe Garibaldi	armored cruiser	7,234	By Austrian submarine	18- 7-15
1370	Turbine	destroyer	330	Scuttled	24- 5-15
1370	Medusa	submarine	300	Torpedoed	17- 6-15

LOSSES OF GERMANY AND HER ALLIES

GERMAN WARSHIP LOSSES

1732	Moltke(?)	battle cruiser	22,640	Submarine, Riga	8-15
632	Blücher	armored cruiser	15,500	By gun fire, North Sea	24- 1-15
1368, 1734	Pommern(?)	battleship	10,000	By British submarine	2- 7-15
276, 673, 1385	Gneisenau	armored cruiser	11,600	By gun fire, Falkland Is.	8-12-14
276, 673, 1385	Scharnhorst	armored cruiser	11,600	By gun fire, Falkland Is.	8-12-14
247	Yorck	armored cruiser	9,050	By mine, Jahde Bay	3-11-14
258	Friedrich Karl	armored cruiser	8,858	By mine in Baltic	12-12-14
	Karlsruhe	unarmored cruiser	4,900	Blown up(?)	11-14
1566	Augsburg	protected cruiser	4,280	By gun fire	7- 8-14
1566	Magdeburg	protected cruiser	4,478	By gun fire, Baltic	27- 8-14
1569, 1856	Mainz	protected cruiser	4,280	By gun fire, Helgoland	28- 8-14
1569, 1856	Koeln	protected cruiser	4,280	By gun fire, Helgoland	28- 8-14

PAGE	NAME	CLASS	TONNAGE	HOW LOST	DATE
1569, 1856	Ariadne	protected cruiser	2,660	By gun fire, Helgoland	28- 8-14
270, 670, 1388	Koenigsberg	protected cruiser	3,550	By gun fire, Rufigi River	4- 7-15
262, 666, 1880	Emden	third class cruiser	3,544	By gun fire, Cocos I.	9-11-14
276, 673, 1385	Leipzig	light cruiser	3,250	By gun fire, Falkland Is.	8-12-14
276, 673, 1386	Nürnberg	light cruiser	3,450	By gun fire, Falkland Is.	8-12-14
1387	Dresden	light cruiser	3,544	By gun fire	14- 3-15
1871, 1861	Hela	small cruiser	2,040	By submarine E-9	13- 9-14
283	Geier	small cruiser	1,630	Interned in Honolulu	8-11-14
1584	Cap Trafalgar	auxiliary cruiser	9,854	By gun fire, Africa	14- 9-14
1578	Kaiser Wilhelm der Grosse	auxiliary cruiser	14,350	By gun fire, Africa	27- 8-14
986	Prinz Eitel Friedrich	converted cruiser	8,865	Interned in Norfolk	7- 4-15
986	Kronprinz Wilhelm	converted cruiser	14,705	Interned in Norfolk	29- 4-15
252	Berlin	converted cruiser	17,324	Interned in Norway	16-11-14
	Patagonia	converted cruiser	——	Seized by Argentina—violation of neutrality	
	Eber	converted cruiser	1,000	Interned at Bahia	9-14
282	Kormoran II	converted cruiser	3,508	Interned at Guam	15-12-14
	V-186	destroyer	750	By gun fire	
1860	V-187	destroyer	650	By gun fire, Helgoland	28- 8-14
	S-106	destroyer	675	By gun fire	
1878	S-90	destroyer	400	Ran ashore and destroyed	20-10-14
1869	S-115	destroyer	420	By gun fire, off Holland	17-10-14
1869	S-117	destroyer	420	By gun fire, off Holland	17-10-14
1869	S-118	destroyer	420	By gun fire, off Holland	17-10-14
1869	S-119	destroyer	420	By gun fire, off Holland	17-10-14
1861	S-126	destroyer	487	By submarine	6-10-14
250	S-124	destroyer	350	Accidentally rammed by Danish steamer	23-11-14
1730	G-196 (type)	destroyer	——	Sunk, North Sea	26- 7-15
1726	Name unknown	destroyer	——	Sunk off Zeebrugge	22- 8-15
270	Taku	destroyer	280	Sunk at Tsing-tao	6-11-14
270	Iltis	river gunboat	900	By gun fire, China	6-11-14
270	Luchs	river gunboat	900	By gun fire, China	6-11-14
270	Tiger	river gunboat	900	By gun fire, China	6-11-14
270	Jaguar	river gunboat	900	By gun fire, China	6-11-14
	Hedwig von Wissmann	gunboat	200	Captured	20- 8-14
	Tsing-tau	gunboat	168	Interned, China	17- 8-14
270	Kormoran	gunboat	1,630	By gun fire, Tsingtau	6-11-14
1732	Two light cruisers		——	Gulf of Riga	17- 8-15
1732	Eight torpedo-boats		——	Gulf of Riga	17- 8-15
	Vaterland	gunboat	168	Interned, China	17- 8-14
1729	U-27	submarine	800	Sunk, North Sea	8-15
	U-51	submarine	——	Sunk, Black Sea	17- 7-15
250	U-18	submarine	750	Rammed by patrol boat	23-11-14
648	U-3	submarine	——	Rammed	9- 8-14
1568	U-15	submarine	250	Rammed, North Sea	9- 8-14
1009	U-29	submarine	800	Lost with all hands	3-15
	U-8	submarine	187	Rammed off Dover	4- 3-15
	U-12	submarine	250	Rammed, British Channel	10- 3-15
	U-14	submarine	300	Sunk	16- 6-15
	A-2	torpedoboat	150	Gun fire	1- 5-15
	A-6	torpedoboat	150	Gun fire	1- 5-15
1566	Koenigin Luise	minelayer	948	By gun fire, North Sea	5- 8-14
	Navarra	auxiliary cruiser	3,641	By Orama's gun fire	11-11-14
1386	Macedonia	supply ship	4,347	Captured	4-15
	Moewe	survey ship	650	By gun fire	9- 8-14
1885	Komet	old destroyer	——	Captured, New Guinea	16-10-14
	Planet	survey ship	650	By gun fire, Yap Island	
	Locksun	naval tender	1,020	Interned in Honolulu	8-11-14
	Karnac	auxiliary transport	4,437	Interned in Chile	11-14
1364	Ophelia	hospital ship	1,153	Captured	17-10-14
1368, 1734	Albatross	minelayer	——	Run ashore	2- 6-15
	Bethania	armed merchantman	4,848	Captured	9-14
	Spreewald	armed merchantman	2,414	Captured	12- 9-14
	Graecia	armed merchantman	1,697	Captured	10-14
	Itolo	armed merchantman	165	Gun fire	9-14
1729	Meteor	auxiliary cruiser	3,613	Sunk, North Sea	8- 8-15

AUSTRIAN WARSHIP LOSSES

270	Kais'n Elizabeth	protected cruiser	4,000	Sunk off Tsingtau	6-11-14
	Beethoven	converted cruiser	2,069	By mine	17-12-14
1574	Zenta	light cruiser	2,300	By gun fire, French fleet	16- 8-14
1584	No. 19	torpedoboat	78	Sunk by mine, Pola	17- 8-14

PAGE	NAME	CLASS	TONNAGE	HOW LOST	DATE
	Name unknown.	torpedoboat	——	Sunk by mine in Adriatic	
	Name unknown.	torpedoboat	——	Sunk by mine in Adriatic	
	Name unknown.	submarine	——	Gun fire, French fleet	19-10-14
	Temes	Danube monitor	440	Mined	23-10-14
	U-11	submarine	860	Sunk by aeroplane	1- 7-15
	Name unknown.	gunboat	——	Sunk, Adriatic	24- 5-15
1735	U-12	submarine	1,000	Sunk by submarine	11- 8-15
1734	U-3	submarine	300	By French destroyer	13- 8-15

TURKISH WARSHIP LOSSES

260	Messudiyeh	battleship	10,000	Sunk by British submarine	13-12-14
1757	Barbarossa	battleship	9,901	By British submarine	9- 8-15
1375	Medjidieh	armored cruiser	3,300	Mined	3- 4-15
1376	Three transports with troops		——	Sunk by Russian warships	
1376, 1757	Berk-i-Satvet (type)	gunboat	725	By mine near Dardanelles	29- 4-15
	Burak Reis	gunboat	500	Scuttled	1-11-14
	Issa Reis (type)	gunboat	420	Mined	12-14
1019	Dhair Hissar	torpedoboat	97	Driven ashore, Greece	17- 4-15
1376	Pelenk-i-Deria	gunboat	775	Torpedoed	23- 5-15
	Bezemialen	troop ship	——	Sunk, Black Sea	14-11-14
	Bachriachmar	troop ship	——	Sunk, Black Sea	14-11-14
	Midiat Pasha	troop ship	——	Sunk, Black Sea	14-11-14
1757	Yar Hissar	torpedo boat	——	Sunk by submarine	6- 9-15

BRITISH WARSHIPS SHELL ZEEBRUGGE

LONDON, Tuesday, August 24.

A naval movement of some consequence is apparently in progress in the North Sea, but only meager details have been received here. British ships have bombarded the German submarine base at Zeebrugge and neighboring points on the Belgian coast.

Berlin asserts that 40 British ships were engaged in it, but the British Admiralty as yet has made no statement.

The firing lasted several hours, the German heavy artillery answering the ship fire.

This is the first report of any serious naval activity in the North Sea since January 24, when the German cruiser *Blücher* was sunk in the battle with the squadron under Admiral Beatty.

A dispatch from Flushing, Holland, gives this version of the affair:

"Several British warships appeared to-day (Monday) off Knocke, Belgium, and bombarded the coast. A press dispatch says that shells burst over a factory between Zeebrugge and Lisseweghe.

"The Germans replied with their coast defence guns, but their fire finally ceased.

"Heavy clouds of smoke appeared over Zeebrugge, but no fires were visible.

"Two large British warships were still off Knocke at 9 o'clock this morning."

The Berlin official report says of the attack:

"Early this morning an enemy fleet, consisting of about 40 ships, appeared before Zeebrugge and steamed away again in a northwesterly direction, after having been bombarbed by our coastal artillery."—*New York Times*, 8/24.

AMSTERDAM, August 26.

Concerning the recent bombardment of Zeebrugge by a British fleet the Tijd says it has learned that a large number of soldiers were killed by the fire of the fleet and that 90 severely wounded men were brought to Ghent.

The material damage done, it adds, was apparently very great, as a shed built for submarines was completely destroyed and with it some submarines. —*New York Times*, 8/27.

GERMANS LOST DESTROYER

AMSTERDAM, August 24.

A telegram from the German Admiralty staff states:

"On the night of August 22-23 a German outpost boat was attacked off Zeebrugge by two hostile destroyers. After a brave resistance the boat

was sunk. Part of the crew were rescued."—*Reuter, Naval and Military Record,* 8/25.

"OUTPOST VESSEL" A DESTROYER.—Within a month of the torpedoing of a German destroyer of the *G 196* type by a British submarine, another destroyer of the enemy has been sunk by French torpedo craft. On August 23, the Ministry of Marine announced that "two French torpedo-boats belonging to the second light squadron encountered a German destroyer off Ostend last night, which they sank after a fight. Our torpedo-boats only sustained insignificant damage to their hulls." Next day (August 24) the loss was admitted by the German Admiralty in the following statement: "On the night of August 22-23 a German outpost vessel was attacked off Zeebrugge by two enemy destroyers and sunk after a brave defence. Part of the crew were saved." The term outpost vessel (vorposten boot) has been favored by the Germans of late to apply to their destroyers in the North Sea, and was used in relation to the two vessels sunk near the North Hinder Lightship on May 1.—*Army and Navy Gazette,* 8/28.

GERMAN SUBMARINE BOMBARDS COAST.—The press bureau issued last night the following account of the incident:

"A German submarine fired several shells at Parton, Harrington and Whitehaven between 4.30 a. m. and 5.20 a. m. to-day.

"No material damage was caused.

"A few shells hit the railway embankment north of Parton, but the train service was only slightly delayed.

"Fires were caused at Whitehaven and at Harrington, which were soon extinguished.

"No casualties have been reported."—*United Service Gazette,* 8/19.

"E 13" TORPEDOED AND SHELLED IN DANISH WATERS

LONDON, August 20.

The Secretary of the Admiralty makes the following announcement:

"The British submarine *E 13,* on its way to the Baltic, grounded yesterday morning on the Danish island of Saltholm, in the Sound.

"Fifteen officers and men are reported to have been saved, while 15 are missing."

LONDON, August 21.

The Secretary of the Admiralty announces:

"Lieut. Commander Layton reports that the submarine grounded in the early morning of August 19, and that all efforts failed to refloat her.

"At 5 a. m. a Danish torpedo-boat appeared on the scene and communicated to *E 13* that she would be allowed 24 hours to try to get oil. At the same time a German torpedo-boat destroyer arrived and remained close to the submarine until two more Danish torpedo-boats came up, when she withdrew.

"At 9 a. m., while three Danish torpedo-boats were anchored close to the submarine, two German torpedo-boat destroyers approached from the south. When about half a mile away one of these destroyers hoisted a commercial flag signal, but before the commanding officer of *E 13* had time to read it the German destroyer fired a torpedo at her from a distance of about 300 yards, which exploded on hitting the bottom close to her.

"At the same moment the German destroyer fired with all her guns, and Lieut. Commander Layton, seeing that his submarine was on fire fore and aft, and unable to defend himself owing to being aground, gave orders for the crew to abandon her.

"While the men were in the water they were fired on by the machine guns and with shrapnel,

"One of the Danish torpedo-boats immediately lowered her boats and steamed between the submarine and the German destroyers, who therefore had to cease fire and withdraw."

DANISH WARSHIPS INTERVENE

COPENHAGEN, Friday (Delayed).

At 10.35 a. m. yesterday, when a Danish squadron was off the shallow Kraare banks in the Drogden passage, on its way to the wreck of the *E 13*, and about five miles distant from it, an explosion was observed near a vessel coming from the south towards the submarine. The commander of the Danish torpedo-boat *Soeulven*, which, with the torpedo-boat *Stoeren*, was near the *E 13*, reports that about 10.30 a. m. he observed two German torpedo vessels going towards the northeast in the Flintraennen Channel, whereupon the *Soeulven* immediately started to meet them and protest against a possible violation of neutrality.

The northernmost of the German vessels was observed flying the following signal: "Leaving vessel as soon as possible." Suddenly the German torpedo-boat discharged some shots against the submarine, which almost instantly took fire. The *Soeulven* immediately went towards the German vessel to stop the attack, upon which the German boat ceased fire and hurried southwards at great speed. As early as 8.45 a. m. a German torpedo-boat had passed by the *E 13* without attempting to attack her. The British flag was hoisted on the *E 13* during the whole cannonade.

Another version of the incident says that a torpedo discharged at the *E 13* missed, but that the German destroyer then fired two shells, which did great damage to the submarine. Two men who were wounded were taken to the naval hospital at Copenhagen.

The affair has stirred public feeling here to its depths. The press is studiously guarded on the matter, but there is an undertone of bitter resentment, emphasis being laid on the point that there is no excuse or explanation possible in face of the fact that the first German torpedo-boat thoroughly investigated the locality before returning with the other. Thus it was a deliberate violation of Danish territory.

The *Hooedstaden* published a rumor that one Danish torpedo-boat had its wireless apparatus damaged and one man wounded.

The *Kjoebenhavn* writes: "We receive with deep pain the news that 14 sailors of a friendly nation have lost their lives not even in unequal combat, but without the faintest chance of defending themselves. There will be public expressions of indignation."

The entire press commends the government for its prompt protest to Berlin, and assures it of the whole nation's support.—*Reuter, Naval and Military Record*, 8/25.

In reply to Danish representations, Germany on August 23 expressed sincere regrets and apologies for the violation of neutrality committed by the German destroyer in firing on the *E 13*.—*Army and Navy Gazette*, 8/28.

NORTH SEA

"LYNX" MINED IN NORTH SEA.—The Secretary of the Admiralty makes the following announcement:

"H. M. S. *Lynx* (destroyer) struck a mine in the North Sea and sank on August 9. Four officers and 22 men were saved."

The *Lynx*, which was completed last year, belonged to the *K* class—not, as her name might suggest, to the *L* class, like the *Lance*, and other destroyers with the same initial which have figured in more than one exploit during the war. She carried three 4-inch guns and was fitted with four 21-inch torpedo-tubes. Her displacement was 935 tons, and she carried normally a crew of about 100.—*New York Times*, 8/11.

"INDIA" TORPEDOED.—The Secretary of the Admiralty made the following announcement on August 12: "H. M. auxiliary cruiser *India*, whilst engaged on patrol duty in the North Sea on August 8, was torpedoed by a German submarine and sunk; 22 officers and 119 men have been saved." The

India was formerly in the P. and O. service, and was of 7900 tons gross, with a speed of 18 knots, built in 1896. Eighty survivors were saved in two of her boats, and others by the British armed trawler *Saxon* and by merchant vessels which came on the scene. On August 12 the Norwegian Government informed Germany that the *India* was torpedoed in what has always been maintained to be Norwegian territorial waters. It was officially announced that just as the Norwegian Government previously insisted in face of the contrary contention of the British Government, that the West Fiord in its entirety was a Norwegian territorial water, the Norwegian Government now, on the occasion of the torpedoing of the *India*, has informed the German Government that the West Fiord has from time immemorial been regarded as belonging to Norwegian sea territory. This is specifically the fact with the part of the Fiord where the *India* was attacked. The Norwegian Government on August 17 announced its decision to intern the survivors rescued by the *Saxon*, but not those saved by neutral vessels.—*Army and Navy Gazette*, 8/21.

As anounced by the British Admiralty, the British patrol boat *Ramsey*, Lieutenant S. Raby, R. N. R., a small armed patrol vessel, was sunk by the German armed auxiliary steamer *Meteor* on August 8 in the North Sea. Four officers and 39 men were saved. The *Meteor* subsequently sighted a squadron of British cruisers, and her commanding officer, realizing that escape was impossible, ordered the crew to abandon the ship and then blew her up. The Admiralty said that five officers were lost in the taking of the *Ramsey*. The *Meteor* was formerly owned by the Hamburg-American Steamship Company and was of 3613 gross tons. The *Ramsey* was a merchant vessel which went into commission in the British Navy in November last. An official German report of the affair, issued August 13, states the *Meteor*, which had slipped through the British patrol, was blown up by her commander to avoid capture by four British warships, which had cut off her escape to her home base. She had previously destroyed the British auxiliary cruiser *Ramsey*, the report says, saving four officers and 40 of her crew. These prisoners and the crew of a sailing ship sunk as a prize, and also the officers and crew of the *Meteor*, all reached a German port safely, the report states. The *Meteor*, it is said, was used as a mine layer.—*Army and Navy Journal*, 8/14.

"U 27" LOST.—The German Admiralty on September 7 made the following announcement: "According to a report of one of our submarines, it met the *U 27* on the high seas after the latter, about August 10, had sunk a small British cruiser of an old type west of the Hebrides Islands (off the coast of Scotland). The *U 27* has not since returned and must be regarded as lost." The *U 27* was built in 1912-13, at the same time as the *U 19*, these craft displacing about 800 tons, and was one of the speediest of the *U* boats constructed up to 1914. Her supposed speed was 18 knots above water and seven submerged, but the exact figures are not known. She was equipped with four torpedo-tubes."—*Army and Navy Journal*, 9/11.

REPORT BRITISH CRUISER AND DESTROYER SUNK

BERLIN, August 19 via wireless to Tuckerton, N. J.).

German torpedo-boat destroyers have sunk a small British cruiser and a British destroyer by torpedoing them in an engagement off the west coast of Jutland, the German Admiralty announced to-day. The statement says:

"On August 17 at 2 o'clock five boats of one of our torpedo-boat flotillas attacked a small modern British cruiser and eight torpedo-boat destroyers near Hornsriff Lightship on the west coast of Jutland, and sank the cruiser and one destroyer with torpedoes. Our forces had no losses.—*New York Times*, 8/20.

GERMAN DESTROYER SUNK.—The Secretary of the Admiralty makes the following announcement:

"A British submarine has returned and reports sinking a German destroyer, believed to be of the *G 196* class, on July 26, near the German coast."—*New York Times*, 8/3.

BALTIC

GULF OF RIGA NAVAL OPERATIONS

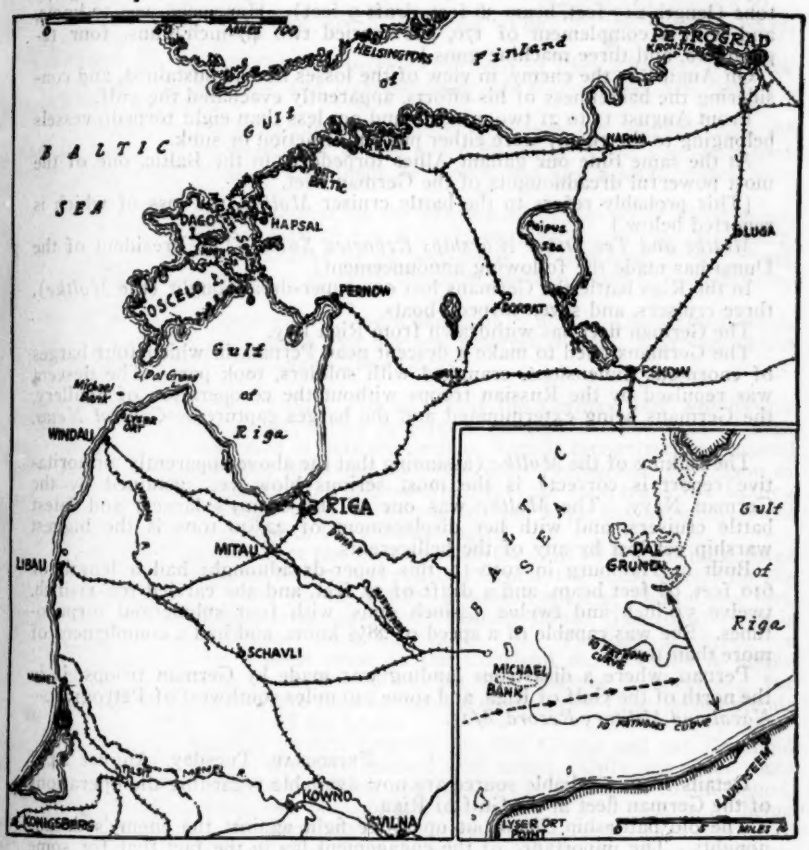
The German movements by sea and land in connection with the invasion of the province of Courland are developing into an attack upon Riga. Libau and Windau have already fallen into German hands, but at both places all the naval and military stores had been previously removed, and at the latter place the docks and ships were destroyed to prevent them being made use of by the enemy. No doubt if Riga can be occupied it will be a heavy blow to Russia, and the German soldiers are already at Tukkum, about 40 miles west of the place. That the Russians will with all the means at their disposal endeavor to defeat any naval operation having for its object the assistance of a land assault on Riga is certain. The Gulf is heavily mined. The Russian fleet under Vice Admiral Kanin should be fully equal to meeting the older vessels of the German navy, and if dreadnought cruisers and battleships are brought into the Gulf the British submarines may have a further opportunity of showing their enterprise and daring. It has now been officially admitted that it was Commander Max Horton who torpedoed the *Pommern* on July 2 off Dantzic, and who has been decorated by the Tsar with the Cross of Saint George. Hitherto the Germans have been singularly unsuccessful in their operations in the Baltic, but it remains to be seen whether they can prove themselves equal to the bigger task they are now attempting.—*Army and Navy Gazette*, 7/24.

A German Baltic fleet has occupied Libau, Russia, as a naval base, says the Copenhagen correspondent of the *London Daily Mail*. A large force of experts is working repairing, adapting and fortifying the harbor works. Libau, in the Province of Courland, was occupied some time ago by German forces. It is about 60 miles by water from the entrance to the Gulf of Riga and about 140 miles by water from the city of Riga.—*Army and Navy Journal*, 8/14.

ACTIONS OF AUGUST 8 AND 10.—Official Russian advices this week, dealing with naval operations in the Gulf of Riga, state on August 10 that three attempts, directed by a German fleet of 9 battleships, 12 cruisers and a large number of torpedo-boat destroyers, to break the mine barrier protecting the Gulf of Riga have been repulsed by the Russian fleet. Operating behind the mine field, the main Russian war fleet, with the aid of seaplanes, put out of action, it is declared, one cruiser and two torpedo-boat destroyers of the Germans, which were badly damaged. While some of the Russian vessels are believed to have been struck, the official report stated that "competent circles affirm categorically that none of our ships were lost." An official explanation of the attack as given out follows: "The Gulf of Riga would allow the Germans to give powerful aid to their army now occupying the western coast of the gulf. With the object of penetrating the gulf, the fleet appeared August 8 off Rirben Channel, which is the only practicable way for large ships to enter. The enemy made three attacks with the object of breaking the mine barrier protected by our fleet, but did not succeed. Our seaplanes and warships co-operated to repel the enemy."

Referring to the naval operations in the Baltic, a German official report of August 12 says: "Our Baltic naval forces on August 10 attacked Russian ships lying in the archipelago near the Schaeren Islands and by their fire forced the Russians to withdraw, among them an armored cruiser of the

Makaroff class. We also silenced the coastal batteries. On the same day other German cruisers drove off Russian torpedo-boats which appeared near the entrance to the Gulf of Riga, and an enemy destroyer was seen to be on fire. Our ships repeatedly were attacked by enemy submarines, but all their torpedoes missed their mark. Our ships suffered neither damage nor losses."—*Army and Navy Journal*, 8/14.



GULF OF RIGA NAVAL ACTIVITY AUGUST 15 TO 21

PETROGRAD, August 23.

The following statement was issued by the Russian Naval staff to-day:

On August 16 the German fleet renewed with heavy forces its attacks on our positions in the entrance to the Gulf of Riga.

During that day and the 17th our vessels repulsed the attacks of the enemy, whose secret preparations for entry into the gulf have been singularly favored by misty weather.

Taking advantage of the thick fog, considerable enemy forces had penetrated into the gulf. Our vessels fell back, while continuing to resist the enemy, without losing touch with him.

From August 19 to August 20 engagements with our vessels continued. As a result the enemy suffered considerable losses among his torpedo craft.

On our side we lost the gunboat *Sivoutch*, which perished gloriously in an unequal action with an enemy cruiser. The *Sivoutch*, wrapped in flame and on fire fore and aft, continued to answer shot for shot until she went down, having previously sunk an enemy torpedo-boat.

[The *Sivoutch*, built at Petrograd 1906-8, was a gunboat displacing 875 tons (length 215 feet, beam 36 feet, draft 9 feet). Her speed was 12 knots, and with a complement of 170, she carried two 4.7-inch guns, four 12-pounders, and three machine guns.]

On August 21 the enemy, in view of the losses he had sustained, and considering the barrenness of his efforts, apparently evacuated the gulf.

From August 15 to 21 two cruisers and not less than eight torpedo vessels belonging to the enemy were either put out of action or sunk.

At the same time our gallant Allies torpedoed, in the Baltic, one of the most powerful dreadnoughts of the German fleet.

[This probably refers to the battle cruiser *Moltke*, the loss of which is reported below.]

Moltke and Ten Other Warships Reported Sunk.—The President of the Duma has made the following announcement:

In the Riga battle the Germans lost one super-dreadnought (the *Moltke*), three cruisers, and seven torpedo-boats.

The German fleet has withdrawn from Riga Bay.

The Germans tried to make a descent near Pernau, in which four barges of enormous dimensions, crammed with soldiers, took part. The descent was repulsed by the Russian troops without the co-operation of artillery, the Germans being exterminated and the barges captured.—*Central News.*

The sinking of the *Moltke* (assuming that the above apparently authoritative report is correct) is the most serious blow yet sustained by the German Navy. The *Moltke* was one of the enemy's largest and latest battle cruisers, and with her displacement of 22,640 tons is the biggest warship yet lost by any of the belligerents.

Built at Hamburg in 1910-11, this super-dreadnought had a length of 610 feet, 96 feet beam, and a draft of 27 feet, and she carried ten 11-inch, twelve 5.9-inch and twelve 3.4-inch guns, with four submerged torpedo-tubes. She was capable of a speed of 28½ knots, and had a complement of more than 1000.

Pernau, where a disastrous landing was made by German troops, is in the north of the Gulf of Riga, and some 240 miles southwest of Petrograd.—*Naval and Military Record*, 8/25.

PETROGRAD, Tuesday, August 24.

Details from a reliable source are now available regarding the operations of the German fleet in the Gulf of Riga.

The old battleship *Slava* put up a fine fight against the enemy's dreadnoughts. The importance of the engagement lay in the fact that for some time it prevented the enemy from forcing the Russian positions. The calm and misty weather favored the enemy, who, under cover of the fog, was able to evade our patrols and destroy our mines with greater ease. Nevertheless, this work cost the Germans some vessels, including a cruiser, which was blown up by one of the mines.

On the night of August 17 the enemy sent into the gulf two of his best destroyers to attack the *Slava*, which was impeding the operations. At dawn the destroyers, having failed to discover the *Slava*, were rejoining the enemy fleet, when they met the destroyer *Novik* (one of the fastest vessels afloat), which immediately gave battle. After 20 minutes' desperate fighting the leading enemy destroyer had one of her funnels carried away, and she suffered other serious damage, which obliged her to take to flight. The other destroyer went to the assistance of her consort, and also gave up the

fight. Soon afterwards the more seriously damaged of the two German vessels apparently went down.

It is also stated that, in addition to the ships already reported, the Germans lost an auxiliary cruiser.—*Reuter, Naval and Military Record,* 8/25.

THE GERMAN VERSION

AMSTERDAM, August 21.

An official *communiqué* issued in Berlin to-day by the German Naval Staff says:

"Our Baltic naval forces penetrated the Gulf of Riga, after several days' difficult mine sweeping and clearing away net obstructions had opened a way into the gulf.

"In outpost engagements whtich developed upon our entrance into the gulf a Russian torpedo-boat of the *Emir Bucharsky* class was destroyed. Other torpedo-boats, among them the *Novik,* and also a large vessel, were heavily damaged.

"In the course of a retreat, on the evening of August 19, in Moon Sund, the Russian gunboats *Sivutch* and *Koreëts* were sunk, after brave fighting, by artillery fire and attacks by torpedo-boats. Forty men of the crews, among them two officers, severely wounded, were rescued by our torpedo-boats.

"Three of our torpedo-boats were damaged by mines. One of them sank, one was able to run ashore, and one was escorted to port. Our loss of life was small."—*Reuter, London Times,* 8/23.

GULF OF RIGA NOT EASILY FORCED.—That the German fleet will have a most difficult task in attempting to force a passage into the Gulf of Riga is the opinion expressed in military circles. Riga is recognized as essential to any German scheme involving an advance on Petrograd. By reason of its geographical location Riga is directly athwart the main trunk line leading from Warsaw through Vilna to Petrograd, and Riga has an independent connection of its own with the Russian capital.

Before the German fleet can hope to enter the Gulf of Riga it must force a passage through the waters between Dal Grund, the shoal waters off the southern end of Oscelö Island, and the Courland coast at Point Lyser Ort. In the center of the passageway is the Michael Bank. The usual route is to pass between Michael Bank and Lyser Ort. The distance from the Dal Grund to the nearest point on the Courland coast, which is in the vicinity of Launtseem, is ten miles, but this distance is shortened for navigation purposes by the four-fathom curve which off Launtseem extends at one point two miles off the beach.

It is this eight-mile stretch between the Dal Grund and the Courland coast which the Russians have blocked with mines. Only one other route is open to enter the Gulf of Riga, and that one is by way of Mohn Sound. This is a very dangerous passage and one which is also capable of being easily defended. The Russians through a number of years have conducted naval maneuvers having for their object the working out of war problems based on the loss of the Gulf of Riga. It would seem as if the Russians have always reckoned on the possibility of Riga falling before a strong naval force and have therefore based their defence of Petrograd on holding the Gulf of Finland. Assuming that Riga is taken, the Russian naval maneuvers were worked out on the assumption that the port of Reval would be the next point of attack. Reval is directly connected with Petrograd by rail and is the natural base for operations of a land force having Petrograd as its immediate objective.

Riga as a rule is frozen in after the first of November and continues so until the last of February or early in March. When the ice comes on the city front it is still possible for vessels to discharge and load for a few weeks longer at Millegraf. The latter place is about five miles below Riga on the Dvina River. Hapsal, Port Baltic and Reval close about

November or December and open in February or early March. During the winter months the Gulf of Riga is covered with ice a considerable distance from shore. It is the practice of the Russian Government to employ ice breakers to prolong the open season at the Riga Gulf and Finland ports.

The success of the Russians in holding back the German fleet from the Gulf of Riga is ascribed in naval circles largely to the Russian naval maneuver experience of recent years, which has to do almost wholly with the problem of holding the Riga Gulf entrance as a preliminary to the defence of the Gulf of Finland. The Russians have the advantage that they can reinforce by way of the Mohn Sound, the passage between Orel and the Hopsal shore, any containing force defending the entrance to Riga. The Gulf of Finland is reported as safe so long as the Gulf of Riga remains in Russian possession.

The Gulf of Finland on its northern side is fringed with reefs. A well-defined passage exists behind these reefs and Russian naval defence of the Finland Gulf largely counts on using this inside passageway. The depth of water is sufficient for large vessels.

Aside from the Finnish reef passage the waters of the Gulf of Finland are open, and there is no block before Petrograd short of Cronstadt. The latter place has long been regarded as possessing one of the most elaborate torpedo-defence schemes of any port in the world. Cronstadt was wrested from the Swedes by Peter the Great in 1703.—*N. Y. Herald*, 8/14.

COMMANDER HORTON, D. S. O.—It is now revealed that the German battleship recently sunk in the Baltic was the *Pommern*, and that she was destroyed by the submarine under the command of Commander Max K. Horton. Early in the war Commodore Keyes in his despatch referred to Lieut. Commander Horton, as he then was, as a "most enterprising submarine officer," and he has certainly justified this encomium. He now has to his credit the following ships:

Pommern, battleship, sunk in Baltic, July 2, 1915.

Hela, light cruiser, sunk off Heligoland, September 13, 1914.

S 116 destroyer, sunk off Borkum, October 6, 1914.—*Naval and Military Record*, 7/28.

GERMAN TRANSPORT SUNK IN BALTIC.—A Russian official *communiqué* of Monday states that a British submarine has sunk a large German transport in the Baltic.—*Naval and Military Record*, 8/4.

"ALBATROSS" INTERNED.—The German minelayer *Albatross*, which in the battle of July 2 ran ashore at Ostergarn, was reported salved on July 24 by the *Neptune*, one of the steamers of a Stockholm salvage company. The cruiser will be interned at Farösound, a Swedish seaport between Gothland and Faroe.—*Army and Navy Gazette*, 7/31.

ADRIATIC

FRENCH DESTROYER SANK AUSTRIA'S "U 3"

PARIS, August 15.

The Austrian submarine *U 3* which was sunk in the Adriatic on August 13, was sent to the bottom by the accurate fire of the guns of the French torpedo-boat destroyer *Bisson*, according to a Havas dispatch from Rome, which gives the details of the activities of the *U 3*.

The Austrian submersible attacked an Italian auxiliary cruiser in the lower Adriatic on August 12, but the larger craft, by the clever maneuvering of her commander, escaped two torpedoes aimed at her. She then rammed the submarine but failed to sink it. A squadron of destroyers immediately set out to chase the submarine, which evidently had been damaged in the encounter with the cruiser. The Austrian vessel was sighted the following morning by the *Bisson* and sunk.

The French official version of the sinking of the Austrian submarine *U 3* was given out by the Ministry of Marine here to-night and reads as follows:

"The Austrian submarine *U 3* after attacking in the Adriatic without success an Italian auxiliary cruiser was pursued during the whole of the afternoon of August 12 by Italian and French torpedo-boat destroyers. The *U 3* was discovered and sunk by gun-fire on the morning of August 13 by the French torpedo-boat destroyer *Bisson*, which made prisoner of one officer and 11 sailors."—*N. Y. Times*, 8/16.

SUBMARINE BASE DESTROYED

TOULON, Sunday.

A navy order issued here announces that the French destroyer *Bisson* has just carried out a brilliant operation by destroying the Austrian submarine and aeroplane supply station at Fagosta Island, cutting the cable and killing several Austrians. The French had one bluejacket killed.—*Reuter, Naval and Military Record*, 7/28.

"U 12" SUNK.—The *U 3* is the second Austrian submarine sunk last week by the Italians, who thus have the satisfaction of avenging the torpedoing of the *Amalfi* and the *Giuseppe Garibaldi*. The *U 3* was one of a pair of vessels launched at the Germania Yard, Kiel, in 1908. She had a length of 142 feet and 12½ feet beam. The surface displacement was 255 tons, and the submerged displacement 295 tons. The vessel had two torpedo-tubes, and carried 17 officers and men.

The submarine sunk earlier in the week was the *U 12*, one of the newest Austrian underwater craft. She had the worst of a duel with an Italian submarine in the Upper Adriatic, and was sunk with all hands. In a similar duel last June the Italian submarine *Medusa* was torpedoed and sunk, and from the reports of divers afterwards it appeared that the Austrian craft also perished, so that at least three of Austria's small band of *U* boats have been accounted for. It will be recalled that last March two German submarines were sunk in one week by British war vessels.—*Naval and Military Record*, 8/18.

The *U 12*, of which type there are three boats, was completed at Pola since the war began. Her displacement was 1000 tons submerged, her speed was supposed to be 18 knots on the surface and 10 knots submerged, and she was armed with five 21-inch torpedo-tubes. Her officers and men probably numbered from 25 to 30.—*N. Y. Times*, 8/18.

BLACK SEA AND DARDANELLES

ALLIED FLEET AT DARDANELLES

BRITISH BATTLESHIPS

Name	Guns	Weight of Broadside: Heavy Guns lbs.	Weight of Broadside: Secondary Guns lbs.
Queen Elizabeth	Eight 15-inch, twelve 6-inch	15,600	600
Inflexible	Eight 12-inch, sixteen 4-inch	6,800	372
Lord Nelson	Four 12-inch, ten 9.2-inch	5,300	..
Agamemnon	" " " "	5,300	..
Swiftsure	" 10-inch, fourteen 7.5-inch	3,312	..
Triumph[1]	" " " "	3,312	..
Cornwallis	" 12-inch, twelve 6-inch	3,400	600
Queen	" " " "	3,400	600
Implacable	" " " "	3,400	600
London	" " " "	3,400	600
Irresistible[1]	" " " "	3,400	600

Name	Guns	Weight of Broadside: Heavy Guns lbs.	Weight of Broadside: Secondary Guns lbs.
Goliath[1]	Four 12-inch, twelve 6-inch	3,400	600
Ocean[1]	" " " "	3,400	600
Vengeance	" " " "	3,400	600
Albion	" " " "	3,400	600
Canopus	" " " "	3,400	600
Prince George	" " " "	3,400	600
Majestic[1]	" " " "	3,400	600
BRITISH CRUISERS, ETC.			
Euryalus	Two 9.2-inch, twelve 6-inch	..	1,360
Dublin	Eight 6-inch	..	500
Minerva	Eleven 6-inch	..	600
Doris	" "	..	600
Talbot	" "	..	600
Phaeton	Two 6-inch, eight 4-inch	..	355
Amethyst	Twelve 4-inch	..	217
Sapphire	Twelve 4-inch	..	217
Hussar	Two 4.7-inch, four 6-pounders	..	102
BRITISH MONITOR			
Humber	Two 6-inch, two 4.7-inch	..	290
BRITISH DESTROYERS			
Scorpion	One 4-inch, three 12-pounders	..	..
Wolverine	" " " "	..	..
Pincher	" " " "	..	..
Renard	" " " "	..	..
Chelmer	Four 12-pounders	..	..
FRENCH BATTLESHIPS			
Suffren	Four 12-inch, ten 6.4-inch	3,880	495
Gaulois	" " " 5.5-inch	3,880	330
Charlemagne	" " " "	3,880	330
St. Louis	" " " "	3,880	330
Bouvet[1]	Two 12-inch, two 10.8-inch, eight 5.5-inch	2,060	308
Henri IV	" 10.8-inch, seven 5.5-inch	1,124	264
Jauréguiberry	" 12-inch, two 10.8-inch, eight 5.5-inch	2,416	264
FRENCH CRUISERS			
Kleber	Eight 6.5-inch. four 3.9-inch	..	754
Jeanne d'Arc	Two 7.6-inch, fourteen 5.5-inch	..	763
D'Entrecasteaux	" 9.4-inch, twelve 5.5-inch	..	1,146
RUSSIAN CRUISER			
Askold	Twelve 6-inch	..	623

[1] Signifies ships lost by mine or torpedo.

SIR IAN HAMILTON ON THE OPERATIONS

The General Commanding the Mediterranean Expeditionary Force has sent the following despatch to the Secretary of State for War:

GENERAL HEADQUARTERS, MEDITERRANEAN EXPEDITIONARY FORCE,
May 20, 1915.

Immediately on arrival on March 17 I conferred with Vice-Admiral de Robeck, commanding the Eastern Mediterranean Fleet; General d'Amade,

commanding the French Corps Expéditionnaire; and Contre Admiral Guepratte, in command of the French squadron. At this conference past difficulties were explained to me, and the intention to make a fresh attack on the morrow was announced. The amphibious battle between warships and land-fortresses took place next day, March 18. I witnessed these stupendous events, and thereupon cabled your lordship my reluctant deduction that the co-operation of the whole of the force under my command would be required to enable the fleet effectively to force the Dardanelles.

By that time I had already carried out a preliminary reconnaissance of the northwestern shore of the Gallipoli Peninsula, from its isthmus, where it is spanned by the Bulair fortified lines, to Cape Helles, at its extreme point. From Bulair this singular feature runs in a southwesterly direction for 52 miles, attaining near its center a breadth of 12 miles. The northern coast of the northern half of the promontory slopes downwards steeply to the Gulf of Xeros, in a chain of hills, which extend as far as Cape Sulva. The precipitous fall of these hills precludes landing, except at a few narrow gullies, far too restricted for any serious military movements. The southern half of the peninsula is shaped like a badly-worn boot. The ankle lies between Kaba Tebe and Kalkmaz Dagh; beneath the heel lie the cluster of forts at Kilid Bahr, while the toe is that promontory, five miles in width, stretching from Tekke Burnu to Sedd-ul-Bahr.

The three dominating features in this southern section seemed to me to be:

1. Saribair Mountain, running up in a succession of almost perpendicular escarpments to 970 feet. The whole mountain seemed to be a network of ravines and covered with thick jungle.

2. Kilid Bahr plateau, which rises, a natural fortification artificially fortified, to a height of 700 feet to cover the forts of the Narrows from an attack from the Ægean.

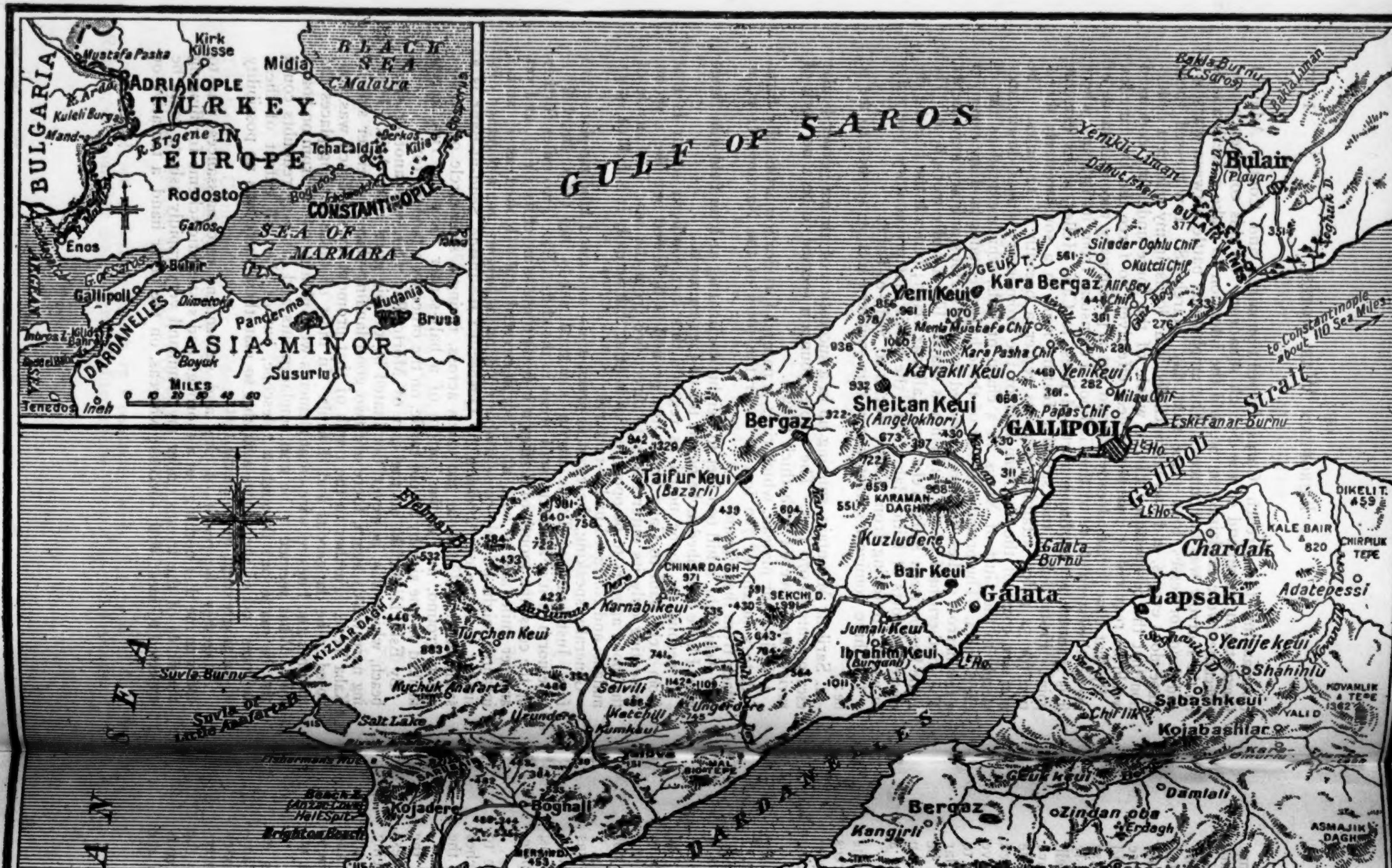
3. Achi Babi, a hill 600 feet in height, dominating at long field-gun range what I have described as being the toe of the peninsula.

A peculiarity to be noted as regards this last southern sector is that from Achi Babi to Cape Helles the ground is hollowed out like a spoon, presenting only its outer edges to direct fire from the sea. The inside of the spoon appears to be open and undulating, but actually it is full of spurs, nullahs, and confused under-features.

Generally speaking, the coast is precipitous, and good landing-places are few. Just south of Tekke Burnu is a small sandy bay (W), and half a mile north of it is another small break in the cliffs (X). Two miles further up the coast the mouth of a stream indents these same cliffs (Y 2), and yet another mile and a half up a scrub-covered gully looked as if active infantry might be able to scramble up it on to heights not altogether dissimilar to those of Abraham, by Quebec (Y). Inside Sedd-ul-Bahr is a sandy beach (V), about 300 yards across, facing a semi-circle of steeply-rising ground, as the flat bottom of a half-saucer faces the rim, a rim flanked on one side by an old castle, on the other by a modern fort.

By Eski Hissarlik, on the east of Morto Bay (S), was another small beach, which was, however, dominated by the big guns from Asia. Turning northwards again, there are two good landing-places on either side of Kaba Tepe. Farther to the north of that promontory the beach was supposed to be dangerous and difficult. In most of these landing-places the trenches and lines of wire entanglements were plainly visible from on board ship. What seemed to be gun emplacements and infantry redoubts could also be made out through a telescope, but of the full extent of these defences and of the forces available to man them there was no possibility of judging except by practical test.

Altogether the result of this and subsequent reconnaissances was to convince me that nothing but a thorough and systematic scheme for flinging the whole of the troops under my command very rapidly ashore could be expected to meet with success; whereas, on the other hand, a tentative or


GULF OF SAROS
Gallipoli Strait
DARDANELLES
SEA
Bulair
(Player)
BULAIR LINES
Bakla Burnu
(C. Saros)
Bakla Liman
Yenikli Liman
To Constantinople about 110 Sea Miles
Eski Fanar Burnu
GALLIPOLI
Kara Bergaz
Yeni Keui
Kavakli Keui
Sheitan Keui
(Angelokhori)
Bergaz
Taifur Keui
(Bazarli)
Kuzludere
Bair Keui
Galata
Galata Burnu
Jumali Keui
Ibrahim Keui
Karnabikeui
Turchen Keui
Kuchuk Anafarta
Suvla Burnu
Suvla or Little Anafarta B.
Salt Lake
Kojadere
Boghali
Brighton Beach
Ejelmar B.
KIZLAR DAGH
CHINAR DAGH
KARAMAN DAGH
Chardak
Lapsaki
Adatepessi
Yenije keui
Shahinlu
Sabashkeui
Kojabashlar
Bergaz
Kangirli
Zindan oba
Damlali
ASMAJIK DAGH
TURKEY
IN
EUROPE
ASIA MINOR
BULGARIA
ADRIANOPLE
Kirk Kilisse
Midia
BLACK SEA
C. Malatra
Rodosto
Ganos
Enos
Bulair
Gallipoli
CONSTANTINOPLE
SEA OF MARMARA
Tchataldja
Panderma
Mudania
Brusa
Susurlu
Boyuk
Dimetoka
Tenedos
Ineh
Imbros I.
MILES 0 10 20 30 40 50

ANGLO-BRITISH FORCES MADE THEIR HISTORIC LANDINGS ON THE GALLIPOLI PENINSULA ON APRIL 25—AT THE BEACHES INDICATED ON THE MAP

The Turks, aided by the rugged nature of the ground, had made the southern spit of the peninsula into a fortress culminating in the height of Achi Baba. The difficulties of landing were followed by equal difficulties of advance. The troops are now athwart the peninsula about four miles from Cape Helles, the French holding the line of the Keveres Dere, and the British carrying on the line in front of Achi Baba and Krithia to the western coast. Australian and New Zealand troops, who landed separately, occupy a strip of coast on the cliffs of Sari Bair. Achi Baba has so far proved impregnable, and our losses have been severe in the several battles which have been fought.

piecemeal program was bound to lead to disaster. The landing of an army upon the theater of operations I have described—a theater strongly garrisoned throughout, and prepared for any such attempt—involved difficulties for which no precedent was forthcoming in military history except possibly in the sinister legends of Xerxes. The beaches were either so well defended by works and guns, or else so restricted by nature that it did not seem possible, even by two or three simultaneous landings, to pass the troops ashore quickly enough to enable them to maintain themselves against the rapid concentration and counter-attack which the enemy was bound in such case to attempt. It became necessary, therefore, not only to land simultaneously at as many points as possible, but to threaten to land at other points as well. The first of these necessities involved another unavoidable, if awkward contingency, the separation by considerable intervals of the force. The weather was also bound to play a vital part in my landing. Had it been British weather there would have been no alternative but instantly to give up the adventure. To land two or three thousand men, and then to have to break off and leave them exposed for a week to the attacks of 34,000 regular troops, with a hundred guns at their back, was not an eventuality to be lightly envisaged. Whatever happened, the weather must always remain an incalculable factor, but at least by delay till the end of April we had a fair chance of several days of consecutive calm.

Before doing anything else I had to redistribute the troops on the transports to suit the order of their disembarkation. The bulk of the forces at my disposal had, perforce, been embarked without its having been possible to pay due attention to the operation upon which I now proposed that they should be launched.

Owing to the lack of facilities at Mudros redistribution in that harbor was out of the question. With your lordship's approval, therefore, I ordered all the transports, except those of the Australian Infantry Brigade, and the details encamped at Lemnos Island, to the Egyptian ports. On March 24 I myself, together with the General Staff, proceeded to Alexandria, where I remained until April 7, working out the allocation of the troops to transports in minutest detail as a prelude to the forthcoming disembarkations. General d'Amade did likewise.

On April 1 the remainder of the general headquarters, which had not been mobilized when I left England, arrived at Alexandria.

Apart from the rearrangements of the troops, my visit to Egypt was not without profit, since it afforded me opportunities of conferring with the G. O. C., Egypt, and of making myself acquainted with the troops, drawn from all parts of the French Republic and of the British Empire, which it was to be my privilege to command.

By April 7 my preparations were sufficiently advanced to enable me to return with my General Staff to Lemnos, so as to put the finishing touches to my plan in close co-ordination with the vice-admiral commanding the Eastern Mediterranean Fleet.

The covering force of the 29th division left Mudros harbor on the evening of April 23 for the five beaches, S, V, W, X, and Y. Of these V, W and X were to be main landings, the landings at S and Y being made mainly to protect the flanks, to disseminate the forces of the enemy, and to interrupt the arrival of his reinforcements. The landings at S and Y were to take place at dawn, whilst it was planned that the first troops for V, W and X beaches should reach the shore simultaneously at 5.30 a. m., after half an hour's bombardment from the fleet.

The transports conveying the covering force arrived off Tenedos on the morning of the 24th, and during the afternoon the troops were transferred to the warships and fleet-sweepers in which they were to approach the shore. About midnight these ships, each towing a number of cutters and other small boats, silently slipped their cables, and, escorted by the third squadron of the fleet, steamed slowly towards their final rendezvous at Cape Helles. The rendezvous was reached just before dawn on the

25th. The morning was absolutely still; there was no sign of life on the shore; a thin veil of mist hung motionless over the promontory; the surface of the sea was as smooth as glass. The four battleships and four cruisers which formed the third squadron at once took up the positions allotted to them, and at 5 a. m., it being then light enough to fire, a violent bombardment of the enemy's defences was begun. Meanwhile the troops were being rapidly transferred to the small boats in which they were to be towed ashore. Not a move on the part of the enemy; except for shells thrown from the Asiatic side of the straits the guns of the fleet remained unanswered.

The detachment detailed for S beach (Eski Hissarlik Point) consisted of the 2d South Wales Borderers (less one company) under Lieutenant Colonel Casson. Their landing was delayed by the current, but by 7.30 a. m. it had been successfully effected at the cost of some 50 casualties, and Lieutenant Colonel Casson was able to establish his small force on the high ground near De Totts Battery. Here he maintained himself until the general advance on the 27th brought him into touch with the main body.

The landing on Y beach was entrusted to the King's Own Scottish Borderers and the Plymouth (Marine) Battalion, Royal Naval Division, specially attached to the 29th division for this task, the whole under command of Lieutenant Colonel Koe. The beach at this point consisted merely of a narrow strip of sand at the foot of a crumbling scrub-covered cliff some 200 feet high immediately to the west of Krithia.

A number of small gullies running down the face of the cliff facilitated the climb to the summit, and so impracticable had these precipices appeared to the Turks that no steps had been taken to defend them. Very different would it have been had we, as was at one time intended, taken Y 2 for this landing. There a large force of infantry, entrenched up to their necks, and supported by machine and Hotchkiss guns, were awaiting an attempt, which could hardly have made good its footing. But at Y both battalions were able in the first instance to establish themselves on the heights, reserves of food, water and ammunition were hauled up to the top of the cliff, and, in accordance with the plan of operations, an endeavor was immediately made to gain touch with the troops landing at X beach. Unfortunately, the enemy's strong detachment from Y 2 interposed, our troops landing at X were fully occupied in attacking the Turks immediately to their front, and the attempt to join hands was not persevered with.

Later in the day a large force of Turks was seen to be advancing upon the cliffs above Y beach from the direction of Krithia, and Colonel Koe was obliged to entrench. From this time onward his small force was subjected to strong and repeated attacks, supported by field artillery, and owing to the configuration of the ground, which here drops inland from the edge of the cliff, the guns of the supporting ships could render him little assistance. Throughout the afternoon and all through the night the Turks made assault after assault upon the British line. They threw bombs into the trenches, and, favored by darkness, actually led a pony with a machine gun on its back over the defences, and were proceeding to come into action in the middle of our position when they were bayoneted. The British repeatedly counter-charged with the bayonet, and always drove off the enemy for the moment, but the Turks were in a vast superiority, and fresh troops took the place of those who temporarily fell back. Colonel Koe (since died of wounds) had become a casualty early in the day, and the number of officers and men killed and wounded during the incessant fighting was very heavy.

By 7 a. m. on the 26th only about half of the King's Own Scottish Borderers remained to man the entrenchments made for four times their number. These brave fellows were absolutely worn out with continuous fighting; it was doubtful if reinforcements could reach them in time, and orders were issued for them to be re-embarked. Thanks to His Majesty's ships *Goliath, Dublin, Amethyst,* and *Sapphire,* thanks also to the devotion

of a small rearguard of the King's Own Scottish Borderers, which kept off the enemy from lining the cliff, the re-embarkation of the whole of the troops, together with the wounded, stores, and ammunition, was safely accomplished, and both battalions were brought round the southern end of the peninsula. Deplorable as the heavy losses had been, and unfortunate as was the tactical failure to make good so much ground at the outset, yet, taking the operation as it stood, there can be no doubt it has contributed greatly to the success of the main attack, seeing that the plucky stand made at Y beach had detained heavy columns of the enemy from arriving at the southern end of the peninsula during what it will be seen was a very touch-and-go struggle.

The landing-place known as X beach consists of a strip of sand some 200 yards long by eight yards wide at the foot of a low cliff. The troops to be landed here were the 1st Royal Fusiliers, who were to be towed ashore from His Majesty's ship *Implacable* in two parties, half a battalion at a time, together with a beach working party found by the Anson Battalion, Royal Naval Division. About 6 a. m. His Majesty's ship *Implacable*, with a boldness much admired by the army, stood quite close in to the beach, firing very rapidly with every gun she could bring to bear.

Thus seconded, the Royal Fusiliers made good their landing with but little loss The battalion then advanced to attack the Turkish trenches on the Hill 114, situated between V and W beaches, but were heavily counter-attacked and forced to give ground. Two more battalions of the 87th Brigade soon followed them, and by evening the troops had established themselves in an entrenched position extending from half a mile round this landing-place and as far south as Hill 114. Here they were in touch with the Lancashire Fusiliers, who had landed on W beach. Brigadier General Marshall, commanding the 87th Brigade, had been wounded during the day's fighting, but continued in command of the brigade.

The landing on V beach was planned to take on the following lines (See page 1381 of July-August PROCEEDINGS):

Twenty-four hours after the disembarkation began there were ashore on V beach the survivors of the Dublin and Munster Fusiliers and of two companies of the Hampshire Regiment. The brigadier and his brigade major had been killed; Lieutenant Colonel Carrington Smith, commanding the Hampshire Regiment, had been killed, and the adjutant had been wounded. The adjutant of the Munster Fusiliers was wounded, and the great majority of the senior officers were either wounded or killed. The remnant of the landing party still crouched on the beach beneath the shelter of the sandy escarpment which had saved so many lives. With them were two officers of my General Staff—Lieutenant Colonel Doughty-Wylie and Lieutenant Colonel Williams. These two officers, who had landed from the *River Clyde*, had been striving, with conspicuous contempt for danger, to keep all their comrades in good heart during this day and night of ceaseless imminent peril.

Now that it was daylight one more, Lieutenant Colonels Doughty-Wylie and Williams set to work to organize an attack on the hill above the beach. Any soldier who has endeavored to pull scattered units together after they have been dominated for many consecutive hours by close and continuous fire will be able to take the measure of their difficulties. Fortunately, General Hunter Weston had arranged with Rear Admiral Wemyss about this same time a heavy bombardment to be opened by the ships upon the old fort, Sedd-el-Bahr village, the old castle north of the village, and on the ground leading up from the beach.

Under cover of this bombardment, and led by Lieutenant Colonel Doughty-Wylie and Captain Walford, Brigade Major, R. A., the troops gained a footing in the village by 10 a. m. They encountered a most stubborn opposition and suffered heavy losses from the fire of well-concealed riflemen and machine guns. Undeterred by the resistance, and supported by the naval gun-fire, they pushed forward, and soon after mid-

day they penetrated to the northern edge of the village, whence they were in position to attack the old castle and Hill 141. During this advance Captain Walford was killed. Lieutenant Colonel Doughty-Wylie had most gallantly led the attack all the way up from the beach through the west side of the village, under a galling fire. And now, when, owing so largely to his own inspiring example and intrepid courage, the position had almost been gained, he was killed while leading the last assault. But the attack was pushed forward without wavering, and, fighting their way across the open with great dash, the troops gained the summit, and occupied the old castle and Hill 141 before 2 p. m.

W beach consists of a strip of deep, powdery sand, some 350 yards long and from 15 to 40 yards wide, situated immediately south of Tekke Burnu, where a small gully running down to the sea opens out a break in the cliffs. On either flank of the beach the ground rises precipitously, but in the center a number of sand dunes afford a more gradual access to the ridge overlooking the sea. Much time and ingenuity had been employed by the Turks in turning this landing place into a death trap. Close to the water's edge a broad wire entanglement extended the whole length of the shore, and a supplementary barbed network lay concealed under the surface of the sea in the shallows.

Land mines and sea mines had been laid. The high ground overlooking the beach was strongly fortified with trenches, to which the gully afforded a natural covered approach. A number of machine guns were also cunningly tucked away into holes in the cliff so as to be immune from a naval bombardment whilst they were converging their fire on the wire entanglements. The crest of the hill overlooking the beach was in its turn commanded by high ground to the northwest and southeast, and especially by two strong infantry redoubts near Point 138. Both these redoubts were protected by wire entanglements about 20 feet broad, and could be approached only by a glacis-like slope leading up from the high ground above W beach or from Cape Helles lighthouse. In addition, another separate entanglement ran down from these two redoubts to the edge of the cliff near the lighthouse, making intercommunication between V and W beaches impossible until these redoubts had been captured.

So strong, in fact, were the defences of W beach that the Turks may well have considered them impregnable, and it is my firm conviction that no finer feat of arms has ever been achieved by the British soldier—or any other soldier—than the storming of these trenches from open boats on the morning of April 25.

The landing at W had been entrusted to the 1st Battalion Lancashire Fusiliers (Major Bishop), and it was to the complete lack of the senses of danger or of fear of this daring battalion that we owed our astonishing success. As in the case of the landing at X, the disembarkation had been delayed for half an hour, but at 6 a. m. the whole battalion approached the shore together, towed by eight picket boats in line abreast, each picket boat pulling four ship's cutters. As soon as shallow water was reached the tows were cast off, and the boats were at once rowed to the shore. Three companies headed for the beach, and a company on the left of the line made for a small ledge of rock immediately under the cliff at Tekke Burnu.

Brigadier General Hare, commanding the 88th Brigade, accompanied this latter party, which escaped the cross-fire brought to bear upon the beach, and was also in a better position than the rest of the battalion to turn the wire entanglements.

While the troops were approaching the shore no shot had been fired from the enemy's trenches, but as soon as the first boat touched the ground a hurricane of lead swept over the battalion. Gallantly led by their officers, the Fusiliers literally hurled themselves ashore and, fired at from right, left and center, commenced hacking their way through the wire.

A long line of men was at once mown down as by a scythe, but the remainder were not to be denied. Covered by the fire of the warships,

which had now closed right in to the shore, and helped by the flanking fire of the company on the extreme left, they broke through the entanglements and collected under the cliffs on either side of the beach. Here the companies were rapidly reformed, and set forth to storm the enemy's entrenchments wherever they could find them.

In making these attacks the bulk of the battalion moved up towards Hill 114, whilst a small party worked down towards the trenches on the Cape Helles side of the landing-place.

Several land mines were exploded by the Turks during the advance, but the determination of the troops was in no way affected. By 10 a. m. three lines of hostile trenches were in our hands, and our hold on the beach was assured.

About 9.30 a. m. more infantry had begun to disembark, and two hours later a junction was effected on Hill 114 with the troops who had landed on X beach.

On the right, owing to the strength of the redoubt on Hill 138, little progress could be made. The small party of Lancashire Fusiliers which had advanced in this direction succeeded in reaching the edge of the wire entanglements, but were not strong enough to do more, and it was here that Major Frankland, Brigade Major of the 86th Infantry Brigade, who had gone forward to make a personal reconnaissance, was unfortunately killed. Brigadier General Hare had been wounded earlier in the day, and Colonel Woolly-Dod, General Staff, 29th Division, was now sent ashore to take command at W beach and organize a further advance.

At 2 p. m., after the ground near Hill 138 had been subjected to a heavy bombardment, the Worcester Regiment advanced to the assault. Several men of this battalion rushed forward with great spirit to cut passages through the entanglement; some were killed, others persevered, and by 4 p. m. the hill and redoubt were captured.

An attempt was now made to join hands with the troops on V beach, who could make no headway at all against the dominating defences of the enemy. To help them out the 86th Brigade pushed forward in an easterly direction along the cliff. There is a limit, however, to the storming of barbed-wire entanglements. More of these barred the way. Again the heroic wire-cutters came out. Through glasses they could be seen quietly snipping away under a hellish fire as if they were pruning a vineyard. Again some of them fell. The fire pouring out of No. 1 fort grew hotter and hotter, until the troops, now thoroughly exhausted by a sleepless night and by the long day's fighting under a hot sun, had to rest on their laurels for a while.

When night fell the British position in front of W beach extended from just east of Cape Helles lighthouse, through Hill 138, to Hill 114. Practically every man had to be thrown into the trenches to hold this line, and the only available reserves on this part of our front were the 2d London Field Company R. E. and a platoon of the Anson Battalion, which had been landed as a beach working party.

During the night several strong and determined counter-attacks were made, all successfully repulsed without loss of ground. Meanwhile the disembarkation of the remainder of the division was proceeding on W and X beaches.

The Australian and New Zealand Army Corps sailed out of Mudros Bay on the afternoon of April 24, escorted by the 2d squadron of the fleet, under Rear Admiral Thursby. The rendezvous was reached just after half-past one in the morning of the 25th, and there the 1500 men who had been placed on board His Majesty's ships before leaving Mudros were transferred to their boats.

This operation was carried out with remarkable expedition and in absolute silence. Simultaneously the remaining 2500 men of the covering force were transferred from their transports to six destroyers. At 2.30 a. m. His Majesty's ships, together with the tows and the destroyers proceeded to within some four miles of the coast, His Majesty's ship *Queen* (flying

Rear Admiral Thursby's flag) directing on a point about a mile north of Kaba Tepe. At 3.30 a. m. orders to go ahead and land were given to the tows, and at 4.10 a. m. the destroyers were ordered to follow.

All these arrangements worked without a hitch, and were carried out in complete orderliness and silence. No breath of wind ruffled the surface of the sea, and every condition was favorable save for the moon, which, sinking behind the ships, may have silhouetted them against its orb, betraying them thus to watchers on the shore.

A rugged and difficult part of the coast had been selected for the landing, so difficult and rugged that I considered the Turks were not at all likely to anticipate such a descent. Indeed, owing to the tows having failed to maintain their exact direction, the actual point of disembarkation was rather more than a mile north of that which I had selected, and was more closely overhung by steeper cliffs. Although this accident increased the initial difficulty of driving the enemy off the heights inland, it has since proved itself to have been a blessing in disguise, inasmuch as the actual base of the force of occupation has been much better defiladed from shell fire.

The beach on which the landing was actually effected is a very narrow strip of sand, about 1000 yards in length, bounded on the north and the south by two small promontories. At its southern extremity a deep ravine, with exceedingly steep, scrub-clad sides, runs inland in a north-easterly direction. Near the northern end of the beach a small but steep gully runs up into the hills at right angles to the shore. Between the ravine and the gully the whole of the beach is backed by the seaward face of the spur which forms the northwestern side of the ravine.

From the top of the spur the ground falls almost sheer except near the southern limit of the beach, where gentler slopes gives access to the mouth of the ravine behind. Further inland lie in a tangled knot the under-features of Saribair, separated by deep ravines, which take a most confusing diversity of direction. Sharp spurs, covered with dense scrub, and falling away in many places in precipitous sandy cliffs, radiate from the principal mass of the mountain, from which they run northwest, west, southwest, and south to the coast.

The boats approached the land in the silence and the darkness, and they were close to the shore before the enemy stirred. Then about one battalion of Turks was seen running along the beach to intercept the lines of boats. At this so critical a moment the conduct of all ranks was most praiseworthy. Not a word was spoken—everyone remained perfectly orderly and quiet awaiting the enemy's fire, which sure enough opened, causing many casualties. The moment the boats touched land the Australians' turn had come.

Like lightning they leapt ashore, and each man as he did so went straight as his bayonet at the enemy. So vigorous was the onslaught that the Turks made no attempt to withstand it and fled from ridge to ridge pursued by the Australian infantry.

This attack was carried out by the 3d Australian Brigade under Major (temporary Colonel) Sinclair Maclagan, D. S. O. The 1st and 2d Brigades followed promptly, and were all disembarked by 2 p. m., by which time 12,000 men and two batteries of Indian Mountain Artillery had been landed. The disembarkation of further artillery was delayed owing to the fact that the enemy's heavy guns opened on the anchorage, and forced the transports which had been subjected to continuous shelling from his field guns, to stand further out to sea.

The broken ground, the thick scrub, the necessity for sending any formed detachments post haste as they landed to the critical point of the moment, the headlong valor of scattered groups of the men who had pressed far farther into the peninsula than had been intended—all these led to confusion and mixing up of units.

Eventually the mixed crowd of fighting men, some advancing from the beach, others falling back before the oncoming Turkish supports, solidified

into a semi-circular position, with its right about a mile north of Kaba Tepe and its left on the high ground over Fisherman's Hut. During this period parties of the 9th and 10th Battalions charged and put out of action three of the enemy's Krupp guns. During this period also the disembarkation of the Australian Division was being followed by that of the New Zealand and Australian Division (two brigades only).

From 11 a. m. to 3 p. m. the enemy, now reinforced to a strength of 20,000 men, attacked the whole line, making a specially strong effort against the 3d Brigade and the left of the 2d Brigade. This counter-attack was, however, handsomely repulsed with the help of the guns of His Majesty's ships. Between 5 and 6.30 p. m. a third most determined counter-attack was made against the 3d Brigade, who held their ground with more than equivalent stubbornness. During the night again the Turks made constant attacks, and the 8th Battalion repelled a bayonet charge; but in spite of all the line held firm.

The troops had had practically no rest on the night of the 24th-25th, they had been fighting hard all day over most difficult country, and they had been subjected to heavy shrapnel fire in the open. Their casualties had been deplorably heavy. But, despite their losses and in spite of their fatigue, the morning of the 26th found them still in good heart and as full of fight as ever.

It is a consolation to know that the Turks suffered still more seriously. Several times our machine-guns got on to them in close formation, and the whole surrounding country is still strewn with their dead of this date.

The reorganization of units and formations was impossible during the 26th and 27th, owing to persistent attacks. An advance was impossible until a reorganization could be effected, and it only remained to entrench the position gained and to perfect the arrangements for bringing up ammunition, water, and supplies to the ridges—in itself a most difficult undertaking. Four battalions of the Royal Naval Division were sent up to reinforce the army corps on April 28 and 29.

On the night of May 2 a bold effort was made to seize a commanding knoll in front of the center of the line. The enemy's enfilading machine guns were too scientifically posted, and 800 men were lost without advantage beyond the infliction of a corresponding loss to the enemy. On May 4 an attempt to seize Kaba Tepe was also unsuccessful, the barbed-wire here being something beyond belief.

But a number of minor operations have been carried out, such as the taking of a Turkish observing station, the strengthening of entrenchments, the reorganization of units, and the perfecting of communication with the landing-place. Also a constant strain has been placed upon some of the best troops of the enemy, who, to the number of 24,000, are constantly kept fighting and being killed and wounded freely, as the Turkish sniper is no match for the Kangaroo shooter, even at his own game.

The assistance of the Royal Navy, here as elsewhere, has been invaluable. The whole of the arrangements have been in Admiral Thursby's hands, and I trust I may be permitted to say what a trusty and powerful friend he has proved himself to be to the Australian and New Zealand army corps.

Concurrently with the British landings a regiment of the French Corps was successfully disembarked at Kum Kale, under the guns of the French fleet, and remained ashore till the morning of the 26th, when they were re-embarked. Five hundred prisoners were captured by the French on this day.

This operation drew the fire of the Asiatic guns from Morto Bay and V beach on to Kum Kale, and contributed largely to the success of the British landings.

On the evening of the 26th the main disembarkation of the French Corps was begun, V beach being allotted to our Allies for this purpose, and it was arranged that the French should hold the portion of the front between the telegraph wire and the sea.

The following day I ordered a general advance to a line stretching from Hill 236 near Eski Hissarlik Point to the mouth of the stream two miles north of Tekke Burnu. This advance, which was commenced at midday, was completed without opposition, and the troops at once consolidated their new line. The forward movement relieved the growing congestion on the beaches, and by giving us possession of several new wells afforded a temporary solution to the water problem, which had hitherto been causing me much anxiety.

By the evening of the 27th the Allied forces had established themselves on a line some three miles long, which stretched from the mouth of the nullah, 3200 yards northeast of Tekke Burnu, to Eski Hissarlik Point, the three brigades of the 29th Division less two battalions on the left and in the center, with four French battalions on the right, and beyond them again the South Wales Borderers on the extreme right. Owing to casualties this line was somewhat thinly held. Still, it was so vital to make what headway we could before the enemy recovered himself and received fresh reinforcements that it was decided to push on as quickly as possible. Orders were therefore issued for a general advance to commence at 8 a. m. next day.

The 29th Division were to march on Krithia, with their left brigade leading, the French were directed to extend their left in conformity with the British movements and to retain their right on the coast-line south of the Kereves Dere.

The advance commenced at 8 a. m. on the 28th, and was carried out with commendable vigor, despite the fact that from the moment of landing the troops had been unable to obtain any proper rest.

The 87th Brigade, with which had been incorporated the Drake Battalion, Royal Naval Division, in the place of the King's Own Scottish Borderers and South Wales Borderers, pushed on rapidly, and by 10 a. m. had advanced some two miles. Here the further progress of the Border regiment was barred by a strong work on the left flank. They halted to concentrate and make disposition to attack it, and at that moment had to withstand a determined counter-attack by the Turks. Aided by heavy gun-fire from H. M. S. *Queen Elizabeth* they succeeded in beating off the attack, but they made no further progress that day, and when night fell entrenched themselves on the ground they had gained in the morning.

The Inniskilling Fusiliers, who advanced with their right on the Krithia ravine, reached a point about three-quartres of a mile southwest of Krithia. This was, however, the farthest limit attained and later on in the day they fell back into line with other corps.

The 88th Brigade on the right of the 87th progressed steadily until about 11.30 a. m. when the stubbornness of the opposition, coupled with a dearth of ammunition, brought their advance to a standstill. The 86th Brigade, under Lieutenant Colonel Casson, which had been held in reserve, were thereupon ordered to push forward through the 88th Brigade in the direction of Krithia.

The movement commenced at about 1 p. m., but though small reconnoitering parties got to within a few hundred yards of Krithia, the main body of the brigade did not get beyond the line held by the 88th Brigade. Meanwhile, the French had also pushed on in the face of strong opposition along the spurs on the western bank of the Kereves Dere, and had got to within a mile of Krithia with their right thrown back and their left in touch with the 88th Brigade. Here they were unable to make further progress; gradually the strength of the resistance made itself felt, and our Allies were forced during the afternoon to give ground.

By 2 p. m. the whole of the troops with the exception of the Drake Battalion had been absorbed into the firing line. The men were exhausted, and the few guns landed at the time were unable to afford them adequate artillery support. The small amount of transport available did not suffice to maintain the supply of munitions, and cartridges were running short despite all efforts to push them up from the landing-places.

Hopes of getting a footing on Achi Babi had now perforce to be abandoned—at least for this occasion. The best that could be expected was that we should be able to maintain what we had won, and when at 3 p. m. the Turks made a determined counter-attack with the bayonet against the center and right of our line, even this seemed exceedingly doubtful. Actually, a partial retirement did take place. The French were also forced back, and at 6 p. m. orders were issued for our troops to entrench themselves as best they could in the positions they then held, with their right flank thrown back so as to maintain connection with our Allies.

In this retirement the right flank of the 88th Brigade was temporarily uncovered, and the Worcester Regiment suffered severely. Had it been possible to push in reinforcements in men, artillery and munitions during the day, Krithia should have fallen, and much subsequent fighting for its capture would have been avoided.

Two days later this would have been feasible, but I had to reckon with the certainty that the enemy would, in that same time, have received proportionately greater support. I was faced by the usual choice of evils, and although the result was not what I had hoped, I have no reason to believe that hesitation and delay would better have answered my purpose.

For, after all, we had pushed forward quite appreciably on the whole. The line eventually held by our troops on the night of the 28th ran from a point on the coast three miles northwest of Tekke Burnu to a point one mile north of Eski Hissarlik, whence it was continued by the French southeast to the coast.

Much inevitable mixing of units of the 86th and 88th Brigades had occurred during the day's fighting, and there was a dangerous re-entrant in the line at the junction of the 87th and 88th Brigades near the Krithia nullah. The French had lost heavily, especially in officers, and required time to reorganize.

April 29 was consequently spent in straightening the line, and in consolidating and strengthening the positions gained. There was a certain amount of artillery and musketry fire, but nothing serious.

Similarly, on the 30th, no advance was made, nor was any attack delivered by the enemy. The landing of the bulk of the artillery was completed, and a readjustment of the line took place, the portion held by the French being somewhat increased.

Two more battalions of the Royal Naval Division had been disembarked, and these, together with three battalions of the 88th Brigade withdrawn from the line, were formed into a reserve.

This reserve was increased on May 1 by the addition of the 29th Indian Infantry Brigade, which released the three battalions of the 88th Brigade to return to the trenches. The Corps Expéditionnaire d'Orient had disembarked the whole of their infantry and all but two of their batteries by the same evening.

At 10 p. m. the Turks opened a hot shell fire upon our position, and half an hour later, just before the rise of the moon, they delivered a series of desperate attacks. Their formation was in three solid lines, the men in the front rank being deprived of ammunition, to make them rely upon the bayonet. The officers were served out with colored Bengal lights to fire from their pistols, red indicating to the Turkish guns that they were to lengthen their range; white that our front trenches had been stormed; green that our main position had been carried.

The Turkish attack was to crawl on hands and knees until the time came for the final rush to be made. An eloquent hortative was signed von Zowenstern, and addressed to the Turkish rank and file, who were called upon, by one mighty effort, to fling us all back into the sea.

"Attack the enemy with the bayonet, and utterly destroy him!

"We shall not retire one step; for, if we do, our religion, our country, and our nation will perish!

"Soldiers! The world is looking at you! Your only hope of salvation is to bring this battle to a successful issue or gloriously to give up your life in the attempt!"

The first momentum of this ponderous onslaught fell upon the right of the 86th Brigade, an unlucky spot, seeing all the officers thereabouts had already been killed or wounded. So when the Turks came right on without firing and charged into the trenches with the bayonet they made an ugly gap in the line. This gap was instantly filled by the 5th Royal Scots (Territorials), who faced to their flank and executed a brilliant bayonet charge against the enemy, and by the Essex Regiment, detached for the purpose by the officer commanding 88th Brigade. The rest of the British line held its own with comparative ease, and it was not found necessary to employ any portion of the reserve.

The storm next broke in fullest violence against the French left, which was held by the Senegalese. Behind them were two British Field Artillery brigades and a Howitzer battery. After several charges and counter-charges the Senegalese began to give ground, and a company of the Worcester Regiment and some gunners were sent forward to hold the gap. Later a second company of the Worcester Regiment was also sent up, and the position was then maintained for the remainder of the night, although, about 2 a. m., it was found necessary to despatch one battalion Royal Naval Division to strengthen the extreme right of the French.

About 5 a. m. a counter-offensive was ordered, and the whole line began to advance. By 7.30 a. m. the British left had gained some 500 yards, and the center had pushed the enemy back and inflicted heavy losses. The right also had gained some ground in conjunction with the French left, but the remainder of the French line was unable to progress. As the British center and left were now subjected to heavy cross-fire from concealed machine guns, it was found impossible to maintain the ground gained, and therefore, about 11 a. m., the whole line withdrew to its former trenches.

The net result of the operations was the repulse of the Turks and the infliction upon them of very heavy losses. At first we had them fairly on the run, and had it not been for those inventions of the devil—machine guns and barbed-wire—which suit the Turkish character and tactics to perfection, we should not have stopped short of the crest of Achi Baba. As it was, all brigades reported great numbers of dead Turks in front of their lines, and 350 prisoners were left in our hands.

On the 2d, during the day, the enemy remained quiet, burying his dead under a red crescent flag, a work with which we did not interfere. Shortly after 9 p. m., however, they made another attack against the whole Allied line, their chief effort being made against the French front, where the ground favored their approach. The attack was repulsed with loss.

During the night 3d-4th the French front was again subjected to a heavy attack, which they were able to repulse without assistance from my general reserve.

The day of the 4th was spent in reorganization, and a portion of the line held by the French, who had lost heavily during the previous night's fighting, was taken over by the 2d Naval Brigade. The night passed quietly.

During the 5th the Lancashire Fusilier Brigade of the East Lancashire Division was disembarked and placed in reserve behind the British left.

Orders were issued for an advance to be carried out next day, and these and the three days' battle which ensued will be dealt with in my next despatch.

The losses, exclusive of the French, during the period covered by this despatch, were, I regret to say, very severe, numbering:

177 officers and 1990 other ranks killed.
412 officers and 7807 other ranks wounded.
13 officers and 3580 other ranks missing.

From a technical point of view it is interesting to note that my Administrative Staff had not reached Mudros by the time when the landings were finally arranged. All the highly elaborative work involved by these landings was put through by my General Staff, working in collaboration

with Commodore Roger Keyes, C. B., M. V. O., and the Naval Transport officers allotted for the purpose by Vice-Admiral de Robeck. Navy and army carried out these combined duties with that perfect harmony which was indeed absolutely essential to success.

Throughout the events I have chronicled the Royal Navy has been father and mother to the Army. Not one of us but realizes how much he owes to Vice-Admiral de Robeck; to the warships, French and British; to the destroyers, mine sweepers, picket boats, and to all their dauntless crews, who took no thought of themselves, but risked everything to give their soldier comrades a fair run in at the enemy.

Throughout these preparations and operations Monsieur le Général d'Amade has given me the benefit of his wide experiences of war, and has afforded me, always, the most loyal and energetic support. The landing of Kum Kale planned by me as a mere diversion to distract the attention of the enemy was transformed by the commander of the Corps Expéditionnaire de l'Orient into a brilliant operation, which secured some substantial results. During the fighting which followed the landing of the French Division at Sedd-ul-Bahr no troops could have acquitted themselves more creditably under very trying circumstances, and under very heavy losses, than those working under the orders of Monsieur le Général d'Amade.

IAN HAMILTON, *General,*
Commanding Mediterranean Expeditionary Force.
—United Service Gazette, 7/15.

ADMIRAL DE ROBECK'S DESPATCH

TRIAD, July 1.

Sir.—I have the honor to forward herewith an account of the operations carried out on April 25 and 26, 1915, during which period the Mediterranean Expeditionary Force was landed and firmly established in the Gallipoli Peninsula.

The landing commenced at 4.20 a. m. on 25th. The general scheme was as follows:

Two main landings were to take place, the first at a point just north of Gaba Tepe, the second on the southern end of the peninsula. In addition, a landing was to be made at Kum Kale, and a demonstration in force to be carried out in the Gulf of Xeros, near Bulair.

The night of the 24th-25th was calm and very clear, with a brilliant moon, which set at 3 a. m.

The first landing, north of Gaba Tepe, was carried out under the orders of Rear Admiral C. F. Thursby, C. M. G. His squadron consisted of the following ships:

Battleships: *Queen, London, Prince of Wales, Triumph, Majestic.*
Cruiser: *Bacchante.*
Destroyers: *Beagle, Bulldog, Foxhound, Scourge, Colne, Usk, Chelmer, Ribble.*
Seaplane Carrier: *Ark Royal.*
Balloon Ship: *Manica.*
And 15 trawlers.

To *Queen, London* and *Prince of Wales* was delegated the duty of actually landing the troops. To *Triumph, Majestic* and *Bacchante* the duty of covering the landing by gun-fire.

In this landing a surprise was attempted. The first troops to be landed were embarked in the battleships *Queen, London* and *Prince of Wales.*

The squadron then approached the land at 2.58 a. m. at a speed of five knots. When within a short distance of the beach selected for landing the boats were sent ahead. At 4.20 a. m. the boats reached the beach and a landing was effected. The remainder of the infantry of the covering force were embarked at 10 p. m., 24th. The troops were landed in two trips, the operation occupying about half an hour, this in spite of the

fact that the landing was vigorously opposed, the surprise being only partially effected.

The disembarkation of the main body was at once proceeded with. The operations were somewhat delayed owing to the transports having to remain a considerable distance from the shore in order to avoid the howitzer and field guns' fire brought to bear on them, and also the fire from warships stationed in the Narrows, Chanak.

The beach here was very narrow and continuously under shell fire. The difficulties of disembarkation were accentuated by the necessity of evacuating the wounded; both operations proceeded simultaneously. The service was one which called for great determination and coolness under fire, and the success achieved indicates the spirit animating all concerned. In this respect I would specially mention the extraordinary gallantry and dash shown by the 3d Australian Infantry Brigade (Colonel E. G. Sinclair Maclagan, D. S. O.), who formed the covering force. Many individual acts of devotion to duty were performed by the personnel of the navy; these are dealt with below. Here I should like to place on record the good service performed by the vessels employed in landing the second part of the covering force; the seamanship displayed and the rapidity with which so large a force was thrown on the beach are deserving of the highest praise.

On the 26th the landing of troops, guns and stores continued throughout the day; this was a most trying service, as the enemy kept up an incessant shrapnel fire, and it was extremely difficult to locate the well-concealed guns of the enemy. Occasional bursts of fire from the ships in the Narrows delayed operations somewhat, but these bursts of fire did not last long, and the fire from our ships always drove the enemy's ships away.

The enemy heavily counter-attacked, and though supported by a very heavy shrapnel fire, he could make no impression on our line, which was every minute becoming stronger. By nightfall on April 26 our position north of Gaba Tepe was secure.

The landing at the southern extremity of the Gallipoli Peninsula was carried out under the orders of Rear Admiral R. E. Wemyss, C. M. G., M. V. O., his squadron consisting of the following ships:

Battleships: *Swiftsure, Implacable, Cornwallis, Albion, Vengeance, Lord Nelson, Prince George.*

Cruisers: *Euryalus, Talbot, Minerva, Dublin.*

Fleet Sweepers: Six.

Trawlers: Fourteen.

Landings in this area were to be attempted at five different places; the conditions at each landing varied considerably. The position of beaches is given below.

Position of Beach.—Y beach, a point about 700 yards northeast of Cape Tekeh. X beach, 1000 yards northeast of Cape Tekeh. W beach, Cape Tekeh-Cape Helles. V beach, Cape Helles-Sedd-ul-Bahr. Camber, Sedd-ul-Bahr. S beach, Eski-Hissarlik Point.

Taking these landings in the above order:

Y Beach.—The troops to the first landed, the King's Own Scottish Borderers, embarked on the 24th in the *Amethyst* and *Sapphire,* and proceeded with the transports *Southland* and *Braemar Castle* to a position off Cape Tekeh. At 4 a. m. the boats proceeded to Y beach, timing their arrival there at 5 a. m., and pulled ashore covered by fire from His Majesty's ship *Goliath.* The landing was most successfully and expeditiously carired out, the troops gaining the top of the high cliffs overlooking this beach without being opposed; this result I consider due to the rapidity with which the disembarkation was carried out and the well-placed covering fire from ships.

The Scottish Borderers were landed in two trips, followed at once by the Plymouth Battalion Royal Marines. These troops met with severe opposition on the top of the cliffs, where fire from covering ships was of little assistance, and, after heavy fighting, were forced to re-embark on the 26th.

The re-embarkation was carried out by the following ships: *Goliath, Talbot, Dublin, Sapphire,* and *Amethyst.* It was most ably conducted by the beach personnel and covered by the fire of the warships, who prevented the enemy reaching the edge of the cliff, except for a few snipers.

X Beach.—The 2d Battalion Royal Fusiliers (two companies and M. G. Section) embarked in *Implacable* on 24th, which ship proceeded to a position off the landing-place, where the disembarkation of the troops commenced at 4.30 a. m., and was completed at 5.15 a. m.

A heavy fire was opened on the cliffs on both sides. The *Implacable* approached the beach, and the troops were ordered to land, fire being continued until the boats were close in to the beach. The troops on board the *Implacable* were all landed by 7 a. m., without any casualties. The nature of the beach was very favorable for the covering fire from ships, but the manner in which this landing was carried out might well serve as a model.

W Beach.—The 1st Battalion Lancashire Fusiliers embarked in *Euryalus* and *Implacable* on the 24th, who proceeded to positions off the landing-place, where the troops embarked in the boats at about 4 a. m. Shortly after 5 a. m. *Euryalus* approached W beach and *Implacable* X beach. At 5 a. m. the covering ships opened a heavy fire on the beach, which was continued up to the last moment before landing. Unfortunately, this fire did not have the effect on the extensive wire entanglements and trenches that had been hoped for, and the troops, on landing at 6 a. m., were met with a very heavy fire from rifles, machine-guns and pom-poms, and found the obstructions on the beach undamaged. The formation of this beach lends itself admirably to the defence, the landing-place being commanded by sloping cliffs offering ideal positions for trenches and giving a perfect field of fire. The only weakness in the enemy's position was on the flanks, where it was just possible to land on the rocks and thus enfilade the more important defences. This landing on the rocks was effected with great skill, and some Maxims, cleverly concealed in the cliffs, and which completely enfiladed the main beach, were rushed with the bayonet. This assisted to a great extent in the success of the landing; the troops, though losing very heavily, were not to be denied, and the beach and the approaches to it were soon in our possession.

The importance of this success cannot be overestimated; W and V beaches were the only two of any size in this area on which troops, other than infantry, could be disembarked, and failure to capture this one might have had serious consequences, as the landing at V was held up. The beach was being continuously sniped, and a fierce infantry battle was carried on round it throughout the entire day and the following night. It is impossible to exalt too highly the service rendered by the 1st Battalion Lancashire Fusiliers in the storming of the beach; the dash and gallantry displayed were superb. Not one whit behind in devotion to duty was the work of the beach personnel, who worked untiringly throughout the day and night, landing troops and stores under continual sniping. The losses due to rifle and machine-gun fire sustained by the boats' crews, to which they had not the satisfaction of being able to reply, bear testimony to the arduous nature of the service.

During the night of the 25th-26th the enemy attacked continuously, and it was not till 1 p. m. on the 26th, when V beach was captured, that our position might be said to be secure.

The work of landing troops, guns, and stores continued throughout this period, and the conduct of all concerned left nothing to be desired.

V Beach.—This beach, it was anticipated, would be the most difficult to capture; it possessed all the advantages for defence which W beach had, and in addition the flanks were strongly guarded by the old castle and village of Sedd-ul-Bahr on the east and perpendicular cliffs on the west; the whole foreshore was covered with barbed-wire entanglements which extended in places under the sea. The position formed a natural amphitheatre with the beach as stage.

The first landing here, as at all other places, was made in boats, but the experiment was tried of landing the remainder of the covering force by means of a collier, the *River Clyde*. This steamer had been specially prepared for the occasion under the directions of Commander Edward Unwin; large ports had been cut in her sides and gangways built whereby the troops could reach the lighters which were to form a bridge on to the beach.

V beach was subjected to a heavy bombardment similarly to W beach, with the same result, *i. e.*, when the first trip attempted to land they were met with a murderous fire from rifle, pom-pom and machine-gun, which was not opened till the boats had cast off from the steamboats.

A landing on the flanks here was impossible, and practically all the first trip were either killed or wounded, a few managing to find some slight shelter under a bank on the beach; in several boats all were either killed or wounded; one boat entirely disappeared, and in another there were only two survivors. Immediately after the boats had reached the beach the *River Clyde* was run ashore under a heavy fire rather towards the eastern end of the beach, where she could form a convenient breakwater during future landing of stores, etc.

As the *River Clyde* grounded, the lighters which were to form the bridge to the shore were run out ahead of the collier, but unfortunately they failed to reach their proper stations, and a gap was left between two lighters, over which it was impossible for men to cross; some attempted to land by jumping from the lighter which was in position into the sea and wading ashore; this method proved too costly, the lighter being soon heaped with dead, and the disembarkation was ordered to cease.

The troops in the *River Clyde* were protected from rifle and machine-gun fire and were in comparative safety.

Commander Unwin, seeing how things were going, left the *River Clyde*, and, standing up to his waist in water under a very heavy fire, got the lighters into position; he was assisted in this work by Midshipman G. L. Drewry, R. N. R., of H. M. S. *Hussar;* Midshipman W. St. A. Malleson, R. N., of H. M. S. *Cornwallis;* Able Seaman W. C. Williams, O. N. 186774 (R. F. R. B. 3766), and Seaman R. N. R. George McKenzie Samson, O. N. 2408 A, both of H. M. S. *Hussar.*

The bridge to the shore, though now passable, could not be used by the troops, anyone appearing on it being instantly shot down, and the men in the *River Clyde* remained in her till nightfall.

At 9.50 a. m. *Albion* sent in launch and pinnace manned by volunteer crews to assist in completing bridge, which did not quite reach beach; these boats, however, could not be got into position until dark owing to heavy fire.

It had already been decided not to continue to disembark on V beach, and all other troops intended for this beach were diverted to W.

The position remained unchanged on V beach throughout the day, men-of-war and the maxims mounted in *River Clyde* doing their utmost to keep down the fire directed on the men under partial shelter on the beach.

During this period many heroic deeds were performed in rescuing the wounded men in the water.

During the night of the 25th-26th the troops in *River Clyde* were able to disembark under cover of darkness and obtain some shelter on the beach and in the village of Sedd-ul-Bahr, for possession of which now commenced a most stubborn fight.

The fight continued, supported ably by gun-fire from H. M. S. *Albion,* until 1.24 p. m., when our troops had gained a position from which they assaulted Hill 141, which dominated the situation. *Albion* then ceased fire and the hill, with old fort on top, was most gallantly stormed by the troops, led by Lieutenant Colonel C. H. H. Doughty-Wylie, General Staff, who fell as the position was won. The taking of this hill effectively cleared the enemy from the neighborhood of the V beach, which could now be used for the disembarkation of the Allied armies. The capture of this beach

called for a display of the utmost gallantry and perseverance from the officers and men of both services—that they successfully accomplished their task bordered on the miraculous.

The Camber, Sedd-ul-Bahr.—One-half company Royal Dublin Fusiliers landed here, without opposition, the *Camber* being "dead ground." The advance from the *Camber,* however, was only possible on a narrow front and after several attempts to enter the village of Sedd-ul-Bahr this half company had to withdraw after suffering heavy losses.

De Totts, S Beach.—The 2d South Wales Borderers (less one company) and a detachment 2d London Field Company R. E. were landed in boats, convoyed by *Cornwallis,* and covered by that ship and *Lord Nelson.* Little opposition was encountered, and the hill was soon in the possession of the South Wales Borderers. The enemy attacked this position on the evening of the 25th and during the 26th, but our troops were firmly established, and with the assistance of the covering ships all attacks were easily beaten off.

Kum Kale.—The landing here was undertaken by the French. It was most important to prevent the enemy occupying positions in this neighborhood, whence he could bring gun-fire to bear on the transports off Cape Helles. It was also hoped that by holding this position it would be possible to deal effectively with the enemy's guns on the Asiatic shore immediately east of Kum Kale, which could fire into Sedd-ul-Bahr and De Totts. The French, after a heavy preliminary bombardment, commenced to land at about 10 a. m., and by the afternoon the whole of their force had been landed at Kum Kale. When they attempted to advance to Yeni Shehr, their immediate objective, they were met by heavy fire from well-concealed trenches, and were held up just south of Kum Kale village. During the night of the 25th-26th the enemy made several counter-attacks, all of which were easily driven off; during one of these 400 Turks were captured, their retreat being cut off by the fire from the battleships. On the 26th, when it became apparent that no advance was possible without entailing severe losses and the landing of large reinforcements, the order was given for the French to withdraw and re-embark, which operation was carried out without serious opposition.

I now propose to make the following more general remarks on the conduct of the operations:

From the very first the co-operation between army and navy was most happy; difficulties which arose were quickly surmounted, and nothing could have exceeded the tactfulness and forethought of Sir Ian Hamilton and his staff. The loyal support which I received from Contre-Amiral E. P. A. Guepratte simplified the task of landing the Allied armies simultaneously. The Russian fleet was represented by H. I. R. M. S. *Askold,* which ship was attached to the French squadron. Contre-Amiral Guepratte bears testimony to the value of the support he received from Captain Ivanoff, especially during the landing and re-embarkation of the French troops at Kum Kale.

The detailed organization of the landing could not be commenced until the army headquarters returned from Egypt on April 10. The work to be done was very great, and the naval personnel and material available small.

Immediately on the arrival of the army staff at Mudros, committees, composed of officers of both services, commenced to work out the details of the landing operations, and it was due to these officers' indefatigable efforts that the expedition was ready to land on the 22d of April. The keenness displayed by the officers and men resulted in a good standard of efficiency, especially in the case of the Australian and New Zealand corps, who appear to be natural boatmen.

Such actions as the storming of the Sedd-ul-Bahr position by the 29th Division must live in history forever; innumerable deeds of heroism and daring were performed; the gallantry and absolute contempt for death displayed alone made the operations possible.

At Gaba Tepe the landing and the dash of the Australian Brigade for the cliffs were magnificent—nothing could stop such men. The Australian and New Zealand army corps in this, their first battle, set a standard as high as that of any army in history, and one of which their countrymen have every reason to be proud.

In closing this despatch, I beg to bring to their lordships' notice the names of certain officers and men who have performed meritorious service. The great traditions of His Majesty's Navy were well maintained, and the list of names submitted of necessity lacks those of many officers and men who performed gallant deeds unobserved and therefore unnoted. This standard was high, and if I specially mention one particular action it is that of Commander Unwin and the two young officers and two seamen who assisted him in the work of establishing communication between *River Clyde* and the beach. Rear Admirals R. E. Wemyss, C. M. G., M. V. O., C. F. Thursby, C. M. G., and Stuart Nicholson, M. V. O., have rendered invaluable service. Throughout they have been indefatigable in their efforts to further the success of the operations, and their loyal support has much lightened my duties and responsibilities.

I have at all times received the most loyal support from the commanding officers of His Majesty's ships during an operation which called for the display of great initiative and seamanship.

Captain R. F. Phillimore, C. B., M. V. O., A. D. C., as principal beach master, and Captain D. L. Dent, as principal naval transport officer, performed most valuable service.—*United Service Gazette*, 8/19.

FRENCH MINE-LAYER "CASABIANCA" SUNK.—An official note issued at Paris, June 7, said: "During the night of June 3-4 the French mine-layer *Casabianca* struck a mine at the entrance to the Ægean Sea. The captain, one officer, and 64 of the crew were rescued by a British destroyer. It is possible that other survivors may have succeeded in gaining the coast and are prisoners in the hands of the Turks."—*Army and Navy Gazette*, 6/12.

The details that have been published of the court-martial held at Toulon over the loss of the *Casabianca* on June 3d last show that this 950-ton *porte-mines* was the victim, not of a successful hostile attack, as at first reported, but of the accidental explosion of its own mines, which blew up the after part of the ship, causing her to sink like a stone with two-thirds of her crew of 164. This is the only mishap of its kind having attended extensive mine-laying on the Allied side. It occurred in the course of a dangerous operation carried out in proximity to the enemy under cover of darkness. Commander de la Fournière, who was saved by mere luck, was exonerated from all blame, and the whole personnel of the *Casabianca* have been "cités à l'ordre du jour" by Amiralissimo de Lapeyrère, for the zeal and bravery they have displayed in the accomplishment of their duty. Part of the crew owed their lives to the timely arrival of a British destroyer, which rescued them from a sinking "vedette."—*Naval and Military Record*, 8/25.

TRANSPORT "ROYAL EDWARD" LOST.—The following is the text of the Admiralty announcement:

"The British transport *Royal Edward* was sunk by an enemy submarine in the Ægean last Saturday morning (August 14).

"According to the information at present available, the transport had on board 32 military officers and 1350 troops, in addition to the ship's crew of 220 officers and men. The troops consisted mainly of reinforcements for the 29th Division and details of the Royal Army Medical Corps.

"Full information has not yet been received, but it is known that about 600 have been saved."

The *Royal Edward* was built on the Clyde in 1908. She was a steel triple-screw steamer of 11,117 tons with a length of 545 feet, a breadth of 60 feet, and a depth of 38 feet.—*London Times*, 8/18.

FRENCH SUBMARINE "MARIOTTE" SUNK

PARIS, July 29.

The Admiralty issues the following *communiqué:*

"The French squadron in the Dardanelles is without direct news of the French submarine *Mariotte*. The submarine entered the Straits on the morning of July 26 in order to operate in the Sea of Marmora.

"According to Turkish telegrams the *Mariotte* has been sunk and 31 officers and sailors composing her crew have been taken prisoners."

. . . . The *Mariotte*, which was built in 1911 at Cherbourg, belongs to the class known as "submersibles." Her length is 215 normal and her tonnage is, afloat, 522 and submerged, 615. She is supplied with Diesel engines. Her surface speed is 15 knots, and below water 10. She is provided with six torpedo-tubes, and has a complement of 28.

This is the second submarine lost by the French in the Dardanelles.

SUBMARINE EXPLOITS.—The Secretary of the Admiralty on August 2 made the following announcement:

"The vice-admiral commanding in the eastern Mediterranean reports that one of the British submarines operating in the Sea of Marmora torpedoed a large steamer of 3000 tons off Mudania Pier, which had several sailing vessels secured alongside. The explosion was very heavy. A small steamer close to Karabogha Bay was torpedoed. A report from Constantinople states that a gunboat was torpedoed in the Sea of Marmora about this time, and possibly the report refers to this occasion. Torpedoes were fired at lighters alongside the arsenal at Constantinople. The result could not be seen, but the explosion was heavy. The Zeitunlik powder mills were fired at, but owing to the darkness the result could not be ascertained. The railway cutting one mile west of Kara Burnu was bombarded and the line blocked temporarily, so that a troop train was unable to pass, and was being fired at as it steamed back, three truckloads of ammunition being blown up."

The special correspondent of the *Times* at Mytilene reported on August 1, on the authority of information from Dedeagatch, that the Galata bridge had been blown up by submarines. The bridge referred to is, no doubt, the iron bridge connecting Galata with Stambul, which was begun in 1909 and was publicly inaugurated in 1912.—*Army and Navy Gazette*, 8/7.

"GOEBEN" AND "BRESLAU" REPORTED TORPEDOED.—Newspaper despatches from Athens of August 12 announce that British submarines which have penetrated the Black Sea have torpedoed the former German cruiser *Breslau* (now *Midilli*) and a transport gunboat in those waters, and also state that the *Goeben*, a former German battle cruiser (now *Sultan Yawus Selim*), has been torpedoed and is now aground in the Bosphorus. The *Breslau* is an armored cruiser of 4550 tons, completed in 1912, and has a speed of 30 knots. The *Goeben* was completed in 1912 and has a speed of 28 knots. Her tonnage is 23,000. The two ships are about the best in the Turkish Navy. No details are given of the torpedoing of the *Midilli*, but the *Goeben*, it is said, after she was torpedoed was run aground in a narrow creek in the Bosphorus, where she is lying alongside shore in default of a dry or floating dock in Turkey sufficiently large to accommodate a vessel of her size. A dike has been built around her from which the Turks are pumping out water. The British Admiralty have received no confirmation of the above.—*Army and Navy Journal*, 8/14.

DAMAGE TO INFLEXIBLE.—A good deal has been made of the revelations in Vice Admiral de Robeck's despatch with reference to the injuries received by the battle cruiser *Inflexible* on March 18, when the *Bouvet*, *Irresistible*, and *Ocean* were sunk. The Admiralty then announced that "the *Inflexible* had her forward control position hit by a heavy shell and requires repair." According to the admiral's despatch this was not strictly the truth. He

reports that "Lieutenant Commander Acheson went down into the fore magazine and shell room of the *Inflexible* when the parties working in these places had been driven out by fumes, caused by the explosion of a mine under the ship; they closed valves and watertight doors, lights being out, the shell room having two feet of water in it, rising quickly, and the magazine flooding slowly." Again it is stated that "during the time H. M. S. *Inflexible* was steaming to Tenedos—after having struck a mine—the engine-room being in semi-darkness and great heat, the ship in possible danger of sinking on passage, a high standard of discipline was called for in the engineer department, a call which was more than met."

BATTLESHIP "HÄIRREDIN BARBAROSSA" AND GUNBOAT "BERK-I-SATVET" TORPEDOED.—It was officially announced on August 9 that the Turkish battleship *Häirredin* (or *Kheyr-ed-Din*) *Barbarossa* was sunk by a British submarine in the Sea of Marmora on August 9. She was formerly the German battleship *Kurfuerst Friedrich Wilhelm*, and carried a crew of 579 men. A majority of the officers and crew are reported saved. She was a battleship of 9901 tons displacement, built in 1891 at a cost of $2,250,000. She carried six 11-inch guns, eight 4.1-inch guns, eight 15½-pounders, had three torpedo-tubes and a speed of 17 knots. The ship was purchased from Germany in 1910 and ranked as one of the principal units of the Turkish fleet. She had an armor belt of 15¾ inches amidships and 12 inches at the ends. British submarines have been active in the Sea of Marmora and even up to the bridges of Constantinople. The Turkish official statement, in admitting the sinking of the battleship, says: "The loss of the *Barbarossa*, which was sunk August 9, however regrettable in itself, does not affect us excessively except that it places the strength of our ships compared to that of the enemy in the ratio of one to ten."

The British vice-admiral in the Dardanelles reports that one of the British submarines operating in these waters sank a Turkish battleship on the morning of August 8 at the entrance to the Sea of Marmora. A Turkish gunboat, the *Berk-i-Satvet*, and an empty transport also have been torpedoed in the Dardanelles by one of the British submarines the report said. A Turkish official communication, dated August 9, reported that the Turkish battleship *Kheyr-ed-Din Barbarossa* had been torpedoed by an enemy submarine. The Turkish gunboat *Berk-i-Satvet* was built at the Krupp works in 1906. She was 262 feet long, 27 feet beam and eight feet deep. She displaced 775 tons. She was fitted with two 4.1-inch guns, six 6-pounders, two 1-pounders and three torpedo-tubes. She had a complement of 105 men. Her speed was 22 knots.—*Army and Navy Journal*, 8/14.

TORPEDO-BOAT "YAR-HISSAR" TORPEDOED.—The Turkish torpedo-boat *Yar-Hissar*, sunk by a British submarine in the Sea of Marmora September 6, was built in 1907 and had a speed of 28 knots. She was armed with one 12-pounder, six 3-pounders and had two 18-inch torpedo-tubes.—*Army and Navy Journal*, 9/11.

FAR EAST, PACIFIC AND ATLANTIC

VICE-ADMIRAL COUNT VON SPEE DESCRIBES THE CRUISER BATTLE FOUGHT OFF CORONEL, CHILE, NOVEMBER 1, 1914.—At 6.07 p. m. the two lines stood nearly parallel to one another on a southerly course, a little over 14,600 yards apart. The *Dresden* was about one mile behind, and the *Nürnberg* was far to the rear. At 6.20, at a distance of 13,400 yards, I turned one point toward the enemy, and at 6.34, at a range of 11,260 yards, I opened fire.

Wind and swell were head on, and the vessels had heavy going, especially the small cruisers on both sides. Observation and distance estimation were under a heavy handicap, because of the seas which washed over the bridges. The swell was so great that it obscured the aim of the gunners at the 10.5-centimeter guns on the middle deck, who could not see the sterns of the enemy's ships at all, and the bows but seldom.

The guns of both our armored cruisers, on the other hand, were effective, and by 6.39 already we could note the first hit on the *Good Hope*. I at once resumed a parallel course, instead of bearing, as before, slightly toward the enemy. The English opened their fire at this time. I assume that the heavy sea made more trouble for them than it did for us. While we ran parallel, and later, as it grew dark, when we increased the distance between us, their two armored cruisers remained covered by our fire, while they, so far as could be determined, hit the *Scharnhorst* only twice and the *Gneisenau* only four times.

At 6.53, when only 6500 yards apart, I ordered a course one point away from the opponent. They were firing more slowly at this time, while we were able to count numerous hits. We could see, among other things, that the top of the forward turret of the *Monmouth* had been shot away and that a violent fire was burning in the turret. The *Scharnhorst*, it is thought, hit the *Good Hope* about 35 times.

In spite of our altered course, the English changed theirs sufficiently so that the distance between us shrunk to 5300 yards. There was reason to suspect that the enemy despaired of using his artillery effectively, and was maneuvering for a torpedo attack. The position of the moon, which had risen at 6 o'clock, was favorable to this move. Accordingly I gradually opened up further distances between the squadrons by another deflection of the leading ship at 7.45.

In the meantime it had grown dark. The range finders on the *Scharnhorst* used the fire on the *Monmouth* as a guide for a time, though eventually all range finding, aiming and observations became so inexact that firing was stopped at 7.26. At 7.23 a column of fire from an explosion was noticed between the stacks of the *Good Hope*. From that time, as it seemed to me, that vessel fired no more. The *Monmouth* apparently stopped firing at 7.20.

The small cruisers, including the *Nürnberg*, received by wireless at 7.30 the order to follow the enemy and to attack their ships with torpedoes. Vision was somewhat influenced at this hour by a rain squall. The light cruisers were not able to find the *Good Hope*, but the *Nürnberg* encountered the *Monmouth*, which steamed at first ahead and then parallel with her. At 8.58 the *Nürnberg* was able, by shots at closest range, to capsize the *Monmouth*, without a shot being fired in return. Rescue work in the heavy sea was not to be thought of, especially as the *Nürnberg* immediately afterward believed she had sighted the smoke of another enemy ship and had to prepare for a new attack.

The *Otranto* turned about as soon as the first shot struck her and later apparently ran away at full speed. The *Glasgow* was able to keep up longest its fire, even though it was ineffective, and succeeded in escaping in the darkness. Both the *Leipzig* and the *Dresden* thought they saw several salvos of hits strike her.

The small cruisers had neither losses nor damages in the battle. On the *Gneisenau* there were two men slightly wounded. The crews of the ships went into the fight with enthusiasm; every one did his duty and played his part in the victory.—*Army and Navy Journal*, 7/31.

A BRITISH COMMENT.—It is pleasant to be able to acknowledge the fair nature of the report of the battle of Coronel given by Admiral von Spee, dated the 1st of November, which has recently been published. It corroborates the report of Captain Luce of the *Glasgow* in all respects and tells us little new. The action commenced, he tells us, at 104 hectometers (about 11,300 yards), and he mentions the difficulty of range-finding in the head sea. He states that the British ships "appeared to suffer more from the heavy seas than we did." He says that the British ships tried to close, and that at one time the opponents were within 49 hectometers of each other (about 5300 yards) when the German ships sheered off, as they thought that the British ships were maneuvering to get within torpedo distance. By this time, 7.45, it was quite dark, the *Good Hope* had ceased to fire some

time previously, and a great explosion had occurred on board her. One thing is clear, namely, that the German ships were faster than our ships, of which Admiral von Spee took full advantage. From the tone of the despatch, as well as from a story that is told of the German admiral's deprecating any undue exultation after the action, we must, I think, exonerate the admiral personally from the charge of having failed to save life from either of the British ships.—*United Service Magazine*, August.

THE "KÖNIGSBERG'S" DOOM.—The following account of the end of the *Königsberg* is contained in a letter from an officer of the R. N. V. R. serving in one of the monitors:

JULY 15.

There is plenty to write about, or ought to be, as we have at last finished the most important thing we came all the way out here for. We have destroyed the *Königsberg;* she is now lying up the River Rufigi, a useless wreck—burnt out.

The *Severn* and *Mersey* had a month hard at it fixing up in Tirene Bay. The men worked from sunrise to sunset, and had one afternoon free only during the whole time. The last few days were taken up practising with the aeroplanes. We anchored off shore and fired at a target the other side of the island. The aeroplane told us where the shots fell and we corrected the aim till the target was hit.

Tuesday, July 6, was the day of the first attempt, and one of the worst I ever had or am likely to have. We were at our stations from 8.45 a. m. till 4.45 p. m., and 11 hours were under fire. The engine-room people were not relieved the whole time, and they were down there the whole time in a temperature of 132-135! It was hot up in the top, but child's play to the engine-room.

We hit the *Königsberg* six times at least, and I believe set her on fire—that was early in the day. Then we lost the target, and I doubt whether we hit her again, though we tried all day till 4 o'clock.

The *Königsberg* was dropping salvos of four very close indeed. We got cheered when we finally emerged, but the job had not been completed.

After two or three days—no rest, not a bit—work tightening up the ship, we finally left about 8 o'clock on Sunday, July 11. All personal gear had been cleared out of the ship—there was not even a chair or a bed, nothing in fact but what was useful. A tug took each of us in tow and away we went. The tug was a bit of guile to deceive the Germans, if they were on the lookout, as when we neared the Kikunja mouth of the Rufigi River again we cast off the tow and headed straight for the entrance.

The Mersey's Escape.—We went to general quarters at 10.40 a. m. and were inside the entrance by 11.40. How well we seemed to know the place! I knew exactly where the beastly field guns at the mouth would open fire and exactly when they would cease—as we pushed in, and so if their shots went over us they would land on the opposite bank among their own troops. Very soon came the soft whistle of the shell, then again and again—but we were nearing the entrance, and they turned on the *Mersey.* They hit her twice, wounding two men and knocking down the after 8-inch gun crew; none were hurt, however.

We left the *Mersey* at the place where we anchored last time in the hope that she would draw the *Königsberg's* fire and leave us a free hand. The *Königsberg,* however, fired one salvo at her and then for the rest of the day concentrated on us. She was plugging us for 17 minutes before we could return her fire. The salvos of four were dropping closer than ever, if possible, and afterwards almost every man in the ship found a bit of German shell on board as a souvenir. They were everywhere—on the decks, round the engine-room, but not a soul was even scratched.

We went on higher up the river than last time, and finally anchored just at the top of "our" old island. As the after 6-inch gun crew were securing the stern anchor two shells fell, one on either side, within 8 feet of the

side and drenched the quarterdeck. It was a very critical time. If she hit us we were probably finished—and she came as near as possible without actually touching.

We had no sooner anchored and laid the guns than the aeroplane signalled she was ready to spot. Our first four salvos, at about one minute interval, were all signalled as, "Did not observe fall of shot." We came down 400, then another 400, and more to the left. The next was spotted as 200 yards over and about 200 to the right. The next 150 short and 100 to the left. The necessary orders were sent to the guns, and at the seventh salvo we hit with one and were just over with the other. We hit eight times in the next 12 shots! It was frightfully exciting.

Mishap to the Aeroplane.—The *Königsberg* was now firing salvos of three only. The aeroplane signalled all hits were forward—so we came a little left to get her amidships. The machine suddenly signalled, "Am hit; coming down; send a boat." And there she was, about half way between us and the *Königsberg*, planing down. As they fell they continued to signal our shots, for we, of course, kept on firing. The aeroplane fell in the water about 150 yards from the *Mersey* and turned a somersault; one man was thrown clear, but the other had a struggle to get free. Finally both got away and were swimming for 10 minutes before the *Mersey's* motor-boat reached them—beating ours by a short head. They were uninjured and as merry as crickets!

We kept on firing steadily the whole time, as we knew we were hitting—about one salvo a minute. The *Königsberg* was now firing two guns; within 17 minutes of our opening fire I noticed and logged it down that she was firing two.

In a very short time there was a big explosion from the direction of the *Königsberg*, and from then on she was never free from smoke, sometimes more, sometimes less—at one moment belching out clouds of black smoke, then yellow, with dull explosions from time to time. We kept on firing regularly ourselves, one salvo to the minute—or perhaps two salvos in three minutes—but the gunlayers were told to keep cool and make sure of their aim. There was one enormous explosion which shot up twice as high as the *Königsberg's* masts, and the resulting smoke was visible even from our deck. The men sent up a huge cheer.

The Cruiser Silenced.—For some time now we had no reply from the *Königsberg*. At 12.53 I fancy she fired one gun, but I was not certain. She certainly did not fire afterwards. As our guns were getting hot we increased the range, as when hot the shots are apt to fall short. Fine columns of smoke, black, white, and yellow, and occasional dull reports rewarded us, but we were making no mistake and kept at it.

Another aeroplane turned up, and we now signalled the *Mersey* to pass on up stream and open fire nearer. She gave us a great cheer as she passed.

We raised our topmast and had a look at the *Königsberg*. She was a fine sight. One mast was leaning over, the other was broken at the maintop, and smoke was pouring out of the mast as out of a chimney. The funnels were gone, and she was a mass of smoke and flame from end to end. We had done all the firing which had destroyed her. The *Mersey* only started afterwards. That was part of the plan. Only one ship was to fire at a time.

The *Mersey* fired about 20 salvos and made several hits and then we prepared to leave the river. Before we went the gunnery lieutenant and myself went to the top of the mast to get a better view and I took a photograph of the smoke, resting the camera on the very top of the topmast! The captain came up too, and there were the three of us clinging to the lightning-conductor with one arm, glasses in the other, and our feet on the empty oil drum we had fixed up there as a crow's nest.

Two tugs were waiting over the bar, and after giving us a cheer took us in tow to help us back quicker to Tirene. The *Weymouth*, with the admiral on board, came round and then, passing us at speed, all hands lined the ship

and, led by the small white figure of the admiral on the bridge, gave us three splendid cheers. It was one of the finest sights I have ever seen. We answered back—and what a difference there was to our cheers of Tuesday last. We made about three times the noise.

By 8 o'clock we were back at Tirene Bay as fresh as paint. No one complained of a headache even. It took us about three hours to cross Mafia Channel. It was a beautiful evening, and hard to believe we had just left a ship (about three times our size, and which under any other conditions would have made mincemeat of us in five minutes) a flaming mass of twisted ironwork.—*London Times*, 8/20.

The *Königsberg*, which was located in the Rufigi, and imprisoned by the sinking of a steamer at the mouth of the river in October, 1914, about the time that the *Emden* was destroyed, was a cruiser of 3350 tons displacement, with a speed of 23½ knots, and a complement of 322. Built at Kiel in 1907, she had a length of 354 feet, 43½ feet beam, and 15¾ feet draft. Her armament consisted of ten 4.1-inch and eight 2.1-inch guns and four machine-guns. It was the *Königsberg* which, on September 20 last, attacked and completely disabled the British third-class cruiser *Pegasus* at Zanzibar.

The monitors *Severn* and *Mersey*, completed by Vickers at Barrow last year, have seen service off the Belgian coast, where they co-operated with the Allies' land forces by shelling the German flank. They are sister ships, with a displacement of 1250 tons (length 265 feet, beam 49 feet, draft 4½ feet), and a speed of 11½ knots. Each has a complement of 100, and is armed with two 6-inch guns, two 4.7-inch howitzers, four 3-pounders, and six machine-guns.

The *Weymouth* is a protected second-class cruiser of 5250 tons displacement, armed with eight 6-inch and several smaller guns.

The *Pioneer* is a light cruiser of H. M. Australian Navy, used as a training ship for Royal Australian Naval Reserve. She was built at Chatham, where she was launched in 1899. She has a displacement of 2200 tons, and her armament consists of eight 4-inch and eight 3-pounder guns.—*Naval and Military Record*, 7/14.

Book Department

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NAVAL ACADEMY GRADUATES' ASSOCIATION

The Secretary has taken advantage of some spare time this summer to inaugurate a campaign for new members in the Association. With that end in view a circular has been mailed to every graduate not already a member of the Association, with the result that about 75 new members have been enrolled, with prospects of quite a number more.

It is hardly necessary to list the reasons why a graduate should join the Association, as every graduate should appreciate the reasons without having them drawn to his attention.

This is simply another step in the attempt to get all graduates interested in the Association, and the work that they are trying to do or will undertake in the future.

The circular as mailed to the non-members is reproduced:

UNITED STATES NAVAL ACADEMY GRADUATES' ASSOCIATION

To the Graduates of the U. S. Naval Academy:

If the financial condition of the Association will permit, it is the intention of the Council to issue a new edition of the "Register of the Graduates of the United States Naval Academy" in 1916.

In looking over the list of graduates, it is found that a number have not joined the Association. It is thought that failure to join has not been due to any lack of interest in the purposes of the Association, but has been due, perhaps, to procrastination or the want of opportunity.

For the last several years the Council have been endeavoring to build up the Association, not so much for the sake of the Association, but as a means to the end that the ties which should and do bind every graduate of the Academy should be more closely drawn.

The Farragut memorial window project which was taken up in 1913 has a dual purpose. To fittingly memorialize one of, if not the greatest of our naval commanders; and, by uniting every graduate in a common effort, to draw them closer to their Alma Mater.

On the succeeding pages will be found the constitution, which clearly sets forth the purposes of the Association. On June 3, 1915, the Secretary's report states that out of 3098 graduates of the Academy still living, 2045 are members of the Association.

The entrance fee is $3.00 and there are no further dues. Applications for membership should be made to the Secretary-Treasurer, U. S. N. A. Graduates' Association, Annapolis, Md.

HON. R. M. THOMPSON, '68.
REAR ADMIRAL W. F. FULLAM, U. S. N., '77.
CHIEF CONST. D. W. TAYLOR, U. S. N., '85.
CAPT. L. H. CHANDLER, U. S. N., '88.
COMDR. J. F. HINES, U. S. N., '92.
PROF. D. M. GARRISON, U. S. N., '95.
LT. COMDR. C. SHACKFORD, U. S. N., '99.
Council.

CONSTITUTION

ART. 1, SEC. 1. The United States Naval Academy Graduates' Association is established for the purpose of promoting kindly feeling and social intercourse among its members, of fostering the memories of the Naval Academy, and of preserving the records of all the graduates.

SEC. 2. It shall be a fixed purpose of the Association to uphold the moral tone, the intellectual standards, the traditions and the esprit of the Naval Academy and of the United States Navy, and to exert its influence to prevent the decline of the high ideals of the Academy and its graduates.

ART. 2. Any one who has successfully pursued the course prescribed by the Academic Board for his class, at the Academy, shall be deemed a graduate, and shall be entitled to become a member of this Association by assenting to the Constitution and By-Laws (except as provided in Art. 3).

ART. 3, SEC. 1. The dismissal from the Navy of any graduate, or the severance of his connection from any government service by reason of moral disqualifications, or the conviction of a graduate in a court of justice of an infamous offense, shall constitute a sufficient ground for his exclusion from this Association if not a member, and for his expulsion if a member.

SEC. 2. It shall be the duty of the Secretary to keep a record vote of those present at the regular annual meeting.

ART. 4, SEC. 1. The senior living member of the Association, according to the numbered list of graduates, shall be the president, and in his absence the senior member present according to the same list shall preside at all meetings. The other officers shall be a Secretary and Treasurer and six members, forming a council of seven, who shall be elected at the annual meeting to serve until the election of their successors, at the next annual meeting.

SEC. 2. It shall be the duty of the Secretary to keep a record of all the graduates of the Naval Academy and a list of the members of this Association and to preserve the minutes of the annual meeting and all papers read thereat. He shall keep in a separate book the minutes of the Council. As Treasurer he shall receive all money belonging to the Association and invest and expend the same as directed by the Council. He shall prepare and present for audit at the annual meeting a statement of all receipts and expenditures.

SEC. 3. It shall be the duty of the Council to make preparation for the annual meeting and dinner; to publish such documents as they may deem of general interest to graduates; to exercise due care in the investment and the expenditure of funds of the Association, to bring to the notice of the annual meeting any action that may become necessary under Art. 3; to fill any vacancy that may occur among the officers of the Association, and in general to take charge of all matters affecting the welfare of the Association.

ART. 5. There shall be an annual meeting and dinner at the Naval Academy, at such time as may be determined by the Council, which all graduates shall be entitled to attend; but no one shall be entitled to speak or to vote at a meeting unless he be a member. Members unable to attend the meeting shall be entitled to vote by proxy in due form in writing.

ART. 6. The entrance fee shall be three dollars, which shall be in lieu of all dues. The expenses of the dinner shall be borne by those attending, at a cost not exceeding five dollars each. Any surplus from the dinner receipts shall be added to the general fund of the Association.

ART. 7. Honorary members may be elected at any annual meeting by a vote of two-thirds of the members present.

The Council only shall nominate persons for election as honorary members. Members who desire the nomination of any person for election as an honorary member shall present the name to the Council at least one month prior to the annual meeting.

ART. 8. The discussion of all topics inimical to the objects of the Association and any proceedings tending thereto, at any meeting, are prohibited.

ART. 9. No alterations, additions nor amendment shall be made to this Constitution except by the vote at two successive annual meetings of a majority of members present or represented by proxy in due form in writing. *Provided*, That the Secretary shall, at least one month before the meeting at which final action on a proposed amendment is to be taken, forward to all the members of the Association a copy of the proposed amendment and a notification of the action in regard thereto taken at the preceding meeting. A postal card addressed to the Secretary shall be enclosed wth this notification and members shall be requested to register their votes, yes or no, according as they are in favor of or opposed to the proposed amendment, and to return the card to the Secretary. These cards shall be regarded as the votes of the absent members who have signed them and shall be duly recorded as such by the tellers appointed to canvass the vote.

Appended is a list of the Graduating Class of 1915, arranged in order of graduation.

All of these have been commissioned into the line as ensigns, with the exception of ten who have been commissioned as second lieutenants, U. S. Marine Corps. This revives the policy, which has lapsed for a number of years, of filling up the vacancies in the lowest rank of the corps by the designation of graduates of the Academy.

The ten above mentioned are as follows:

4301	Mitchell, Ralph J.	4390	Howard, Archie F.
4317	Burwell, Robert O. B.	4391	Wright, Raymond R.
4327	de Roode, Louis R.	4405	Burstan, Rupert M.
4345	Minnis, John A.	4422	del Valle, Pedro A.
4355	Peck, De Witt.	4436	O'Neill, Ewan E.

MIDSHIPMEN, DATE OF 1911, GRADUATING CLASS OF 1915

No.	Name	State in which born	State from which appointed	No. in Grad. Ass'n
4286	Adams, Richard Ranney	Md.	Utah	2468
4287	McCormick, Lynde Dupuy	Md.	At large	2469
4288	Tovey, Henry Oliver	Ill.	Ill.	2470
4289	Sperry, Mark Leavenworth, Jr	Conn.	Conn.	2471
4290	Baker, Robert Nicholson Scott	D. C.	N. H.	2472
4291	Nelson, William	Minn.	Minn.	
4292	Davis, Arthur Cayley	S. C.	Nebr.	2473
4293	Shofner Wesley Jackson	Oreg.	Cal.	2474
4294	Manly, John McCabe	Colo.	Ohio	
4295	Ritchie, Oliver Henderson	Utah	Utah	2475
4296	Kinne, Merrill Talmage	N. Y.	N. Y.	
4297	Struble, Arthur Dewey	Oreg.	Oreg.	2476
4298	Hicks, Walter Alexander	Ala.	Ala.	2477
4299	Portz, Warner Philip	Ohio	Ohio	
4300	Lewis, Leverett Shepherd	Tex.	N. Y.	
4301	Mitchell, Ralph Johnson	Conn.	Conn.	
4302	Culbert, Frederick Paul	Pa.	N. J.	
4303	Pennoyer, Frederick William, Jr	N. J.	N. J.	
4304	Bodfish, Howes	Mass.	Mass.	2478
4305	Perry, Benjamin Franklin	Ohio	Ohio	
4306	Bates, Richard Waller	Cal.	Cal.	
4307	Moore, Louis Robert	Ill.	Ill.	
4308	Bates, John Frederick, Jr	Pa.	Pa.	
4309	Glennon, Philip Thompson	Md.	N. Y.	
4310	Kell, Claude Owen	Ill.	Alaska	2479
4311	Horn, Roy de Saussure	Ga.	Ga.	2480
4312	Shoemaker, James Marshall	Mont.	Mont.	2481

No.	Name	State in which born	State from which appointed	No. in Grad. Ass'n
4313	Pike, Winfred Henry Asa, Jr	Nev.	Nev.	
4314	Wood, Gerald Hadden	Minn.	N. Y.	2482
4315	Partello, Melville Cochran	Ohio	At large	
4316	Preston, Kendall	N. J.	Colo.	2483
4317	Burwell, Robert Oswald Burton	N. C.	N. C.	2484
4318	Glover, Robert Ogden	Va.	Ga.	
4319	Armstrong, Lloyd Van Horn	Ind.	Tenn.	
4320	Powers, Melville Williams	N. Y.	N. Y.	
4321	Rockwell, John Hobart	N. Y.	N. Y.	2485
4322	Laferty, Paul Gause	Mich.	Ohio	
4323	Vickery, Howard Leroy	Ohio	Ohio	
4324	Glann, Arthur Edward	N. Y.	N. Y.	2486
4325	Godfrey, Vincent Hubbard	Cal.	Mass.	
4326	Chenoweth, Harry Hobbs	Pa.	Pa.	2487
4327	de Roode, Louis Remsen	Md.	N. Y.	
4328	Eldredge, Hugh Gwynne	Tenn.	Tenn.	2488
4329	Clark, Stuart Benson	Ill.	Ill.	
4330	Hazlett, Edward Everett, Jr	Kans.	Kans.	
4331	Lusk, John Clinton	Minn.	Nev.	
4332	Calvert, Norwood Giles	N. C.	N. C.	
4333	Scott, Leon Buford	S. C.	S. C.	2489
4334	Osborn, Charles Francis	Mo.	Mo.	
4335	Lamont, George Peter	Kans.	Cal.	
4336	Bowman, William Hammond	Ga.	S. C.	
4337	Wynne, Walter Moakler Anthony	N. Y.	N. Y.	
4338	Umsted, Scott	Pa.	Pa.	2490
4339	Walker, Myron Joseph	Iowa	Iowa	
4340	Smith, Finney Bascom	Tex.	Okla.	
4341	Lorenz, William Joseph	Pa.	Pa.	
4342	Rhea, Powell McClellan	Ark.	Ark.	2491
4343	Isaacs, Edouard Victor Michael	Iowa	Ill.	2492
4344	Burnett, Henry Poynter	Ky.	Ky.	
4345	Minnis, John Andrew	Ala.	Ala.	2493
4346	McCoach, Edwin Stuart	Pa.	Pa.	
4347	Paddock, Hubert Esterly	Mich.	Mich.	
4348	Dalton, Donald MacLean	Ill.	Iowa	2494
4349	Chandler, Theodore Edson	Md.	N. H.	2495
4350	Wiley, Herbert Victor	Mo.	Mo.	
4351	Graham, Ivan Montrose	Hawaii	Hawaii	2496
4352	Shumaker, Samuel Robert	Pa.	Pa.	2497
4353	Wagner, Frank Dechant	Pa.	Pa.	2498
4354	Matteson, Stephen Hubert	Minn.	Minn.	
4355	Peck, De Witt	Cal.	N. Y.	
4356	Nimitz, Otto	Tex.	Tex.	
4357	Easton, Glenn Herman	Mich.	Mich.	2499
4358	Chippendale, Burton Whitham	Mass.	Mass.	2500

No.	Name	State in which born	State from which appointed	No. in Grad. Ass'n
4359	Wurtele, Allan Ramsey	Ill.	Minn.	2501
4360	Peyton, Thomas Green	Va.	W. Va.	
4361	Jenkins, Samuel Power	Ind.	Mo.	
4362	Flynn, Cornelius William	N. Y.	N. J.	
4363	Leonard, Nelson Jackson	Ind.	Ind.	
4364	Granat, William	Cal.	Cal.	
4365	Darrow, Robert Turner	Conn.	Conn.	2502
4366	Farrar, Robert Morse	S. D.	N. Dak.	2503
4367	Clark, Charles Glover	N. Y.	N. J.	
4368	Thomas, Armit Chester	Pa.	Pa.	
4369	Rockwell, Stephen Geiger	Minn.	Ohio	
4370	Tisdale, Ryland Dillard	Md.	Md.	2504
4371	Grove, George Wilson	Pa.	N. J.	2505
4372	Confer, Walter John	Ohio	Ohio	
4373	Barnett, Alan	Ohio	Ohio	
4374	Delpino, Julius Caesar	Pa.	Pa.	
4375	Graf, Homer William	Ill.	Iowa	
4376	Small, John Davis	Tex.	Ark.	
4377	Jondreau, Romeo Joseph	Nebr.	Iowa	
4378	Clark, Robert William	N. Y.	N. Y.	2506
4379	Lein, Conrad Ludwig	Minn.	Minn.	2507
4380	Kneip, John Boniface	Minn.	Minn.	
4381	Hill, George Chaffee	Ill.	D. C.	2508
4382	Low, Francis Stuart	N. Y.	Mass.	2509
4383	Brown, James Potter	Ill.	Ill.	
4384	Alexander, William Dennison	Okla.	Wyo.	
4385	Mail, Francis Marlin, Jr	Ind.	Ind.	
4386	Winslow, Winthrop	Me.	Me.	
4387	Huntoon, Frank Campbell	Ill.	Ill.	
4388	Nunnally, Willian Josiah	Ala.	Ga.	2510
4389	Childs, Earle Wayne Freed	Pa.	Pa.	2511
4390	Howard, Archie Franklin	Kans.	Kans.	
4391	Wright, Raymond Race	Iowa	Nebr.	
4392	Wetherspoon, Alexander Somerville	N. Y.	N. Y.	2512
4393	Morgan, Philip Clark	Conn.	Conn.	
4394	Forston, Robert Malcolm	Ga.	Ga.	
4395	Miller, Marcus Clifford	Md.	At large	2513
4396	Royal, Forrest Betton	N. Y.	N. Y.	2514
4397	McCrea, John Livingston	Mich.	Mich.	
4398	Spriggs, Morris Homer	Ohio	Ohio	
4399	Richards, Frederick Gore	N. Y.	Me.	2515
4400	Arnold, Marshall Britt	Cal.	Mo.	
4401	Withers, Noble	Colo.	Nev.	2516
4402	Blair, Roswell Hadfield	Wis.	Wis.	2517
4403	Shelley, Tully	D. C.	Va.	2518
4404	Henning, Elmer Richard	D. C.	D. C.	

No.	Name	State in which born	State from which appointed	No. in Grad. Ass'n
4405	Burstan, Rupert Mandell	Del.	Del.	
4406	Dupre, Dallas Daisy	Tex.	Tex.	
4407	Pigman, Nathaniel Moore	Kans.	Kans.	
4408	Farnsworth, John Semer	Ill.	Ohio	
4409	Clarke, Horace Donald	Iowa	Iowa	
4410	Breed, Edward	Pa.	Pa.	2519
4411	Brown, Thomas Gilbert	R. I.	R. I.	
4412	Maher, James Edward	N. Y.	Pa.	
4413	Chambers, Irving Reynolds	R. I.	N. Y.	
4414	Hatch, Alexander Gilchrist	Hawaii	Mo.	
4415	Smith, Allan Edward	Mich.	Mich.	
4416	Wood, Leighton	Ala.	Ala.	2520
4417	Lewis, Chester E.	Ohio	Ohio	
4418	Overesch, Harvey Edward	Ind.	Ind.	
4419	Maher, Stuart Augustine	Me.	Conn.	
4420	Harrison, Homer Howard Hobson	Ind.	Ill.	
4421	Kiely, Ralph	N. Y.	N. Y.	
4422	del Valle, Pedro Augusto	P. R.	P. R.	
4423	Quynn, Allen George	Md.	Md.	2521
4424	Field, John Morris, Jr	D. C.	At large	
4425	Collins, David McLernon	Mass.	Mass.	2522
4426	King, Archer Emmet	Va.	Va.	2523
4427	Armstrong, Daniel Williams	S. C.	At large	
4428	Hunter, Harold O'Driscoll	Ga.	Ga.	2524
4429	Kriner, George Cascaden	Pa.	Pa.	2525
4430	Libenow, Forrest Knox	N. Y.	Wash.	
4431	Richardson, Clifford Geer	Mass.	Conn.	
4432	Watson, Dewitt Chapin	Mich.	Mich.	2526
4433	Lewis, James Mackey	Tex.	Tex.	
4434	Meyers, Harold Milton	Pa.	Pa.	
4435	Burhen, Raymond	Ohio	Ohio	2527
4436	O'Neill, Ewen Eugene	Mass.	N. Y.	2528
4437	Sprague, Jonathan Henry	Mich.	Mich.	
4438	Gamble, Millard Gobert, Jr	Ga.	Ga.	2529
4439	Hutchinson, Myron Wells	N. D.	N. Dak.	2530
4440	Campman, John Henry	Tex.	Tex.	2531
4441	Schlossbach, Isaac	N. J.	N. J.	2532
4442	Ring, Morton Loomis	N. Y.	N. Y.	
4443	Clark, Henry Schieffelin, Jr	N. Y.	N. Y.	2533
4444	Mahoney, John Joseph	Mass.	Mass.	
4445	Christie, Ralph Waldo	Mass.	Mass.	2534
4446	Parkinson, Robert Moody	Mo.	Idaho	
4447	Stedman, Lewis Leiper	Wash.	Wash.	2535
4448	Kyle, James Roland, Jr	Va.	Va.	
4449	Marshall, Preston	Minn.	N. Y.	
4450	Thomas, William Daniel	Tenn.	Tenn.	

No.	Name	State in which born	State from which appointed	No. in Grad. Ass'n
4451	Hoops, Lyman Blair	Me.	Conn.	
4452	Fisher, Hilbert Adam	N. C.	N. C.	2536
4453	Hactor, William Sandwood	Nebr.	Mo.	
4454	Deets, Samuel Russel	Md.	Md.	
4455	Ray, John Stites	Colo.	N. Y.	
4456	Wedderburn, Charles Foster	Ill.	Md.	
4457	Snelling, William Morton	Ga.	Ga.	2537
4458	Vickrey, Claude Claire	Kans.	Kans.	2538
4459	Grimm, Henry Ford, Jr	N. Y.	N. Y.	
4460	Dollarhide, E. S	Ark.	Ark.	
4461	Hough, Elmer Byron	Ind.	W. Va.	
4462	Chadwick, Joseph Howard	Mass.	Mass.	
4463	Stephan, Albert Ralph	Ill.	Idaho	
4464	Landis, Arthur	N. C.	N. C.	

CHANGES IN REGISTER

470 Class '61 McCormick, Alexander H.
Ret., Mar. 26, '00, R. Admi.; Died, Aug. 21, '15, Annapolis, Md.

640 " '65 Elliott, William H.
Res., Apr. 27, '70, Lt.; Died, Dec. 10, '14, Chicago, Ill.

1806 " '85 Joynes, Walker W.
Hon. dis., June 30, '87, N. Cdt.; Ret., Aug. 31, '15, Captain, U. S. C. G.

2320 " '98 Woods, Edward.
Ret., July 31, '15, Lt. Comdr.

2401 " '00 Ferguson, William B., Jr.
Res., July 13, '15, Nav. Const.

2530 " '02 Sterling, Frank W.
Ret., July 19, '15, Lt. Comdr.

2643 " '04 Otterson, John E.
Res., July 31, '15, Nav. Const.
Winchester Repeating Arms Co., New Haven, Conn.

3166 " '08 Muir, Boyce K.
Ret., July 19, '15, Lt. (J. G.).

3601 " '10 Gilbert, Homer B.
Ret., June 15, '15, Lt. (J. G.).

3800 " '11 Melvin, John T.
Res., Aug. 20, '15, Lt. (J. G.).

3952 " '12 Whiteside, George W.
Res., July 9, '15, Ens.
Carrollton, Illinois.

4294 " '15 Manly, John McC.
Died, June 24, '15, Mid., Columbus, Ohio.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its forty-second year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

Sec. 8. The annual dues for regular and associate members shall be two dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be thirty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published every two months, and anyone may subscribe for them. The annual subscription is $3.00; single copies, 50 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1916

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award for the prize will be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1916. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the PROCEEDINGS of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the PROCEEDINGS of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

8. It is requested that all essays be submitted typewritten and in duplicate, if practicable; essays submitted written in longhand and in single copy will, however, receive equal consideration.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

B. C. ALLEN,
Lieut. Commander, U. S. N., Secretary and Treasurer.

PRIZE ESSAY TOPICS

SUGGESTED AT THE INVITATION OF THE BOARD OF CONTROL

BY

THE PRESIDENT OF THE NAVAL INSTITUTE, THE SUPERINTENDENT OF THE NAVAL ACADEMY, THE PRESIDENT OF THE NAVAL WAR COLLEGE, AND THE COMMANDERS-IN-CHIEF OF THE ATLANTIC, PACIFIC AND ASIATIC FLEETS.

"The Mutual Relations of Gunnery and Tactics."

"The Place of the Naval Officer in International Affairs."

"The Evolution of Naval Doctrine from National Character."

"The Training of Enlisted Personnel to Produce Modern Man-o'-Warsmen: (a) Military Training; (b) Moral Training: (c) Education."

"The Organization, Employment and Training of Reserve Fleets and Flotillas."

"A Personnel Reserve for the Naval Service."

"Value of Speed as an Offensive Element in Battleship Strategy and Tactics, as Compared with Armor."

LIST OF PRIZE ESSAYS

1879

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENCE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotton, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut.-Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut.-Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut.-Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-Day. Prize Essay, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. Navy.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

MILITARY PREPAREDNESS. Honorable Mention, 1914. By Naval Constructor Richard D. Gatewood, U. S. Navy.

1915

The Rôle of Doctrine in Naval Warfare. Prize Essay, 1915. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

AN AIR FLEET: OUR PRESSING NAVAL WANT. First Honorable Mention, 1915. By Lieutenant Commander Thomas Drayton Parker, U. S. Navy.

TACTICS. Second Honorable Mention, 1915. By Ensign H. H. Frost, U. S. Navy.

DEFENSE AGAINST SURPRISE TORPEDO ATTACK. Third Honorable Mention, 1915. By Ensign R. T. Merrill, 2d, U. S. Navy.